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In awarding the Gold Medal, the referees wish it to be understood that though they consider the Essay they have selected as the best of those referred to them, they do not consider themselves responsible for the views given, and cannot always agree with the writer.

NAVAL PRIZE ESSAY.

THE TACTICS BEST ADAPTED FOR DEVELOPING THE POWER OF EXISTING SHIPS AND WEAPONS (GUN, RAM, AND TORPEDO) WHICH SHOULD REGULATE FLEETS, GROUPS, AND SINGLE VESSELS IN ACTION.

By Commander F. C. D. STURDEE, R.N.

"Non licet in bello bis peccare."

THE subject of the Essay for 1893 is the great aim of a naval officer's thought and training, and is to him of vital importance, so that, when the opportunity occurs, he may prove himself worthy of the best traditions of what one proudly believes to be the first navy in the world.

Holding that view, one naturally feels a certain reluctance in writing on a subject which has been so generally considered. With the rapid improvements that are continually being made, it is however necessary to periodically study how these developments affect Tactics.

Since the essay was given for competition, one of the most appalling accidents that has ever been known in the history of our nation, in peace-time, has happened, and the world at large has learnt in a very realistic manner the tremendous power of one of the weapons which is given to be considered.

This, no doubt, will have a very lasting effect on the popular mind, and will, with many, enhance the value of the ram as a weapon; but, on maturer consideration, technical opinion will, no doubt, recognise that it has not, to any material extent, altered its relative value, for the simple reason that the ship rammed did not in any way try to avoid the blow, or, as would happen in an engagement, to also act on the offensive, and endeavour to meet his opponent on equal terms.

This, probably, would have entirely altered the result, and we might have seen both ships going to the bottom instead of one, or perhaps the attacking ship rammed instead, owing to some error in turning or in estimating the speed of the enemy, or more probable still, by a skilful use of manœuvring power by the defender.

For these reasons, it does not appear to be wise to attempt to draw any conclusions from the accidental use of the ram.

Want of Experience in Modern Naval Actions.—In commencing to consider the use of these weapons in a future naval action, one is at once met by the great fundamental difficulty there is in deriving much useful experience from the great battles fought by our forefathers. This is mainly due to the comparatively long length of time which has elapsed since two maritime nations have actually met in war, and of the enormous strides which have in the meantime been made in the development of vessels of war and of their weapons, which, apparently, is still unceasingly going on; so that the tactics of to-day may not necessarily be those of to-morrow, as, owing to a fundamental change in any of the weapons, or the introduction of a new one, everything might be altered.

It is an undisputed point that history should be consulted whenever possible, in order that advantage may be taken of all previous experience; but owing to these rapid changes since the beginning of this century, and to the very few occasions when modern ships have met in action, very little information can be gathered as to what are the best tactics to adopt.

Although, with regard to strategy, the changes have not materially altered the main points.

As the one notable modern sea fight, Lissa, has been so often and ably dealt with, it appears to be unnecessary to refer to it more than to draw any possible conclusions.

Besides this action, there have been several single-ship actions; but it is a noteworthy fact, that torpedoes were only used in one of them, the ships not having been armed with them in any of the others.

The *ram* and the *torpedo* having now been adopted by maritime nations for some years, they have naturally formed the subject of many papers by different writers, and, as might be expected, have also been given on two former occasions for competition under slightly different titles.

In 1880, by this Institution, when Captain, now Sir Edmund, Fremantle's essay was awarded the medal. In that essay he fully dealt with the tactics that, in his opinion, should be adopted.

I shall therefore take that year as a starting point, and see what advance has been made, and consider how it has affected the tactics to be adopted.

First. To Consider the Advance.—Compare the ships of the present day with those in existence at that time.

In that year practically none of the battle-ships which we would now rely on as our first line of defence were even on the stocks.

And of those that were in, or ready for commission, only 23 now remain; but these, owing to their low speed, would not add to the strength of any modern fleet, and will probably only be kept as a reserve fleet or second line of defence.

It is a noteworthy fact that the original maximum speed of these ships was only $13\frac{3}{4}$ knots, while that of all battle-ships built since that date is $16\frac{1}{2}$ knots, and of the newer ones ordered under the Naval Defence Act between $17\frac{1}{2}$ and 18 knots. This increase of speed alone would give an Admiral commanding a fleet of these ships the opportunity for effecting great possibilities, both from a strategical and tactical point of view, and ought not to be forgotten when organizing the different fleets.

Greater economy in the expenditure of fuel has also been obtained.

The propelling power of the ships has been duplicated by the universal adoption of twin screws.

An increased number of watertight compartments have been adopted with a view to neutralise the destructive effect of a torpedo exploding in contact.

There is a marked difference in the distribution of armour, as in the period before the construction of the "Inflexible" a complete armour belt had been adopted, and considered of vital importance, but, owing to the increasing power of guns, a greater thickness of armour was required which necessitated a compromise; the change being most marked in the "Inflexible."

With the reduction of vertical armour, horizontal armour in the shape of an armoured deck was introduced, to protect the vitals of the ship from gun-fire.

The disposition of the armour in the various ships has been a fruitful source of discussion, but, as it does not materially affect the tactics to be adopted, it is only necessary to briefly take note of it.

It is important to keep in mind the self-evident fact that armour is of little or no avail against the ram or torpedo.

Cruisers.—As regards *cruisers*, an entire change has been made, the only ones remaining of any fighting efficiency being the "Iris" and "Mercury," and the three armoured cruisers "Nelson," "Northampton," and "Shannon," whose low speed and enormous consumption of fuel precludes them from being of much use as cruisers. The class of cruiser which has now been called into existence is required to have great speed, which fortunately has been obtained by those built under the Naval Defence Act.

The *sine quâ non* of a cruiser is that it should be able to realize and maintain a higher speed than a battle-ship.

This did not appear to be, at one time, fully recognised, and in

1880, with the exception of the "Raleigh" and a few of her class, and the two mentioned above, the average maximum speed of our cruisers was between 12 and 13 knots (less than that of the battle-ships).

This would have prevented them being used in company with battle-ships, whereas our present ones, with a speed of 19 knots, have already in the manœuvres proved themselves of great use in that capacity.

As such a large number of cruisers accompany fleets in these days, it may be expected that there will be many brushes between them and those of the enemy.

Guns.—As to guns, many and great improvements have been made, such as increased muzzle-velocity, and thereby flatter trajectory and a proportionate increase in accuracy; their increase in power and size, the improvements in sighting, the gradual introduction of smokeless powder, and the introduction of quick-firing guns, have all tended to increase their fighting value, while as regards our navy, the adoption of B.L. guns has been a complete revolution.

Torpedoes.—As regards torpedoes. In 1880 Sir Edmund Fremantle says: "The torpedo is in its infancy; the Whitehead has had no opportunity of showing how it stands the rough test of war"; but in 1886, the same officer, in a lecture on Naval Tactics, mentions the rapid strides it had then made, and lays considerable stress on the fact that, in dealing with naval tactics, torpedo-boats and torpedo-vessels must be considered as potent factors which will have to be reckoned with.

Since the latter date, this weapon has again advanced, and now has a speed of over 30 knots for a 600-yard range, and the explosive carried has been increased from 60 lbs. to 190 lbs., besides which it has been materially improved in reliability of running, and can be discharged from submerged tubes on the broadside, which, in these days of Q.F. guns, is a great advantage.

Torpedoes have called into existence a special class of vessel to carry them viz., "*the torpedo-boat.*" The first of these boats was only just built in 1880; but great improvements have since been made in them. None of the original boats were able to keep the sea, and although attempts were made to attach them to a squadron, instead of being of any service they only proved a hindrance. This fact has prejudiced officers from allowing boats to act with fleets, more particularly in our navy. But rapid strides have been made by all foreign nations in the building of these boats, and most of them have introduced a class of boats called *torpilleurs-de-haute-mer*, or seagoing torpedo-boats, for the express purpose of their accompanying fleets. During the French and Italian manœuvres boats of this type are regularly attached to the contending fleets.

Torpedo-boat Destroyers.—Besides the seagoing torpedo-boats which will accompany foreign fleets, another class of vessel has been specially introduced, called either torpedo-gunboats, torpedo-catchers, or torpedo-boat destroyers. The prime use of these vessels is to destroy the enemy's boats, and they are now attached to fleets for

the protection of the battle-ships. All nations arm them with torpedo-tubes as well as guns, so they can be used offensively, if required, and it may be assumed some of them will be used for that purpose, advancing under cover of the fire of their own ships, or attacking suddenly and unexpectedly if in the neighbourhood of an enemy's fleet at night, while the remainder are kept for defence.

It is, therefore, important to reconsider the relative importance of the ram with the gun and torpedo, owing to the considerable development of both these weapons.

History of the Ram.—The history of the *ram* is unique, having, since the days of the ancient galley, fallen into disuse. The reason of this was the inability of sailing ships to proceed in any but certain directions. The introduction of steam enabled ships to proceed in any direction, and thus rendered its use possible. Still rams did not come into use until the American Civil War, and it even then required the well-known attack on the "Cumberland" by the "Merrimac," which ended in the former ship being sunk, in order to show its power. This at once directed professional opinion to the importance of the ram and the enormous power which any ship so fitted possessed. For many years the ram as a weapon predominated over the others, which view was more extensively held in consequence of the sinking of the "Rè d'Italia" by the "Ferdinand Max" in the battle of Lissa; in fact, so strongly was its value considered that some officers recommended the building of unsinkable rams not armed with any guns, a certain number of these rams being attached to each fleet.

In our navy two ships, the "Rupert" and "Hotspur," were built primarily as rams, but were armed with guns; and a third one, the "Polyphemus," as a torpedo ram.

In the new United States programme of ship-building, 10 rams have been included which will possess only a few small quick-firing guns.

I venture to think that the tragic effect of the success of the ram far outshines its many failures and possible dangers, and has led officers to attach more importance to it than it deserves, particularly when one considers what is required of the captain of a ram, if success is to be attained.

Table A has been drawn up with an idea of showing how often it has been used in actual war and has succeeded; it appears a dispiriting table to anyone who intends to devote all his attention to ramming on the first opportunity; even the often quoted battle of Lissa does not speak much in its favour, considering the number of attempts that were made for the one success. These failures would be much more serious in a battle in these days, as the penalty of failure has been made very great, first by the introduction of the towing torpedo, and now by the more powerful and formidable Whitehead torpedo. (Neither of these weapons existed at Lissa.)

Ships failing to ram will, in the majority of cases, have to pass under the stern of their opponent, and the nearer they are to being successful, the closer they will have to pass under his stern. It can

easily be shown, and will probably be accepted by all officers, who even are not great torpedo advocates, that a ship similarly placed runs an enormous risk of being successfully torpedoed.

This has been recognised, and all ships, both foreign and our own, are now fitted with stern and quarter torpedo-tubes, which tubes appear to be of the very greatest importance.

With reference to the difficulty of ramming, Captain Mahan very truly points out, "that to effect ramming the ship must be taken to a single point in the field of action, whereas projectile weapons may be used from many points of a wide area," and also when it is remembered that the difference between ramming and being rammed is only half a ship's length—*i.e.*, if you are just over half a ship's length too far ahead you are rammed—and, again, if you are just over half a ship's length too far astern you pass under your opponent's stern and are torpedoed, which, put into time-limits, shows perhaps more clearly the risks which have to be taken; thus a ship 360 ft. in length, at the moderate speed of 12 knots, passes over half her length in less than 10 seconds; thus if you make a 10-second error either way, instead of sinking your enemy, you are destroyed.

Most advocates of the ram recognise this element of chance, and when one considers what difficulty there is in divining even the enemy's speed, and more so what he is going to do the next moment, besides taking into account the rapid rate the ships will probably be approaching each other—probably 30 knots—and their rapid change of bearing, an error of a few seconds in putting the helm over is more than probable, and if not rectified immediately, which may not even be possible, is fatal. I consider it is too much to trust to chance, say, in an action between two equally well-armed ships, but it may be resorted to in certain cases.

In discussing ramming manœuvres, as in all similar discussions, one is apt to ignore how much will be done by one's opponent to frustrate it being successful; and I cannot help thinking that in an action of this kind, if two equal ships, or nearly so, commanded by able men, met, that the end of the encounter would be that they would meet end-on, and both ships would go down, or if not, they would both be rendered useless for any further action. If this surmise is true, nothing would be gained to either side. I notice Lord Armstrong is reported as having said at the annual meeting of his firm that he considers if the "Camperdown" had been proceeding at, say, an "action speed," she would have been seriously crippled, and "be in imminent danger of following her victim to the bottom."

Bearing these facts in mind, it appears to be doubtful if the captain of a well disciplined ship, efficiently armed and with men properly trained in gunnery, would risk everything in order to try and ram his opponent directly they meet; and I think he would preferably cripple him with his guns first, and then, when an opportunity occurred, close and give him the final blow with his torpedoes, and, if necessary, the ram.

Naval opinion appears to be coming round somewhat to the latter

opinion, and as guns and torpedoes become more deadly, and ships get larger and more valuable, the ram, although the most deadly weapon, recedes from its position of primary importance.

In support of the latter view, Admiral Long, in his last lecture at this Institution, said:—

"On comparing the views set forth in 1880 with those indicated in 1886, we are at once struck with the influence the torpedo has exercised in modifying the conception of a sea fight therein exhibited. At the former period the ram held a paramount place as the arm whose effective use constituted the tactical object even during the first phase of an engagement.

"At the latter date the torpedo is admitted to be some counterpoise to the ram, and the possibility of an artillery duel constituting the first phase of an engagement between fleets is contemplated.

"The progress of the gunnery and torpedo equipment during the last five years has certainly strengthened the arguments in favour of the latter view, and the anticipated introduction of smokeless powder will lessen, if not altogether remove, the impediments to manœuvring resulting from the smoke of guns."

Lord Brassey, in this year's "Naval Annual," however, quotes quite an opposite opinion from a letter written by Captain Thomas:—"Being a strong believer in the ram, I look to its being used more frequently as artillery becomes more destructive. . . . In action a captain would not attempt to direct the guns. He would con the ship, and seek the best opportunity for ramming."

Table B and C gives the opinions of different writers as to which is the primary weapon, B in a single ship action, and C in a fleet action.

Of the three weapons, in my opinion, the *gun* takes the first place, and my reason for giving it that position is primarily on account of its long range, which allows it to become effective long before either of the other two. The *torpedo* comes next, particularly when fired from a submerged tube, while the *ram* comes last, for the reasons given above.

This order may possibly be altered in a few special classes of ships where one or other of the weapons are given special prominence, and also in certain cases—for instance, finding a ship at anchor in an open roadstead, &c.

To use either of these weapons effectively, continuous practice is of the greatest importance; this is more particularly the case with the gun. Therefore, if tactics are framed with the idea that that weapon is the primary one, a most methodical system of training the guns' crews in aiming and firing at moving objects, and the officers in judging distances, directing the Nos. 1 when and what to fire at, &c., must be continually going on in all men-of-war.

This applies also to the quarterly allowance of ammunition, which perhaps is not always expended in the most effective manner for training the men, and it is of the very greatest importance that this practice should not be hurried over.

A truth that must always be kept in the foreground is that the

whole object of a man-of-war is to fight, and anything that detracts from that aim must be at once removed or remedied.

In these days of quick-firing guns and high-explosive shell, any ship manned with men insufficiently trained in gun practice is more than ever likely to fall an easy prey in case of meeting an antagonist who has devoted attention to this important subject.

Two well-known cases in former wars may be quoted in exemplification of this:—1, the celebrated action between the "Shannon" and the "Chesapeake," 2 (in the American Civil War), between the armoured rams "Weehawken" and "Atalanta."

In the latter action the Federal ram "Weehawken" approached within 200 yds. and fired five deliberate shots at the "Atalanta," four of which hit, and were sufficient to compel the latter to surrender in less than a quarter of an hour.

It is a curious coincidence that in both these actions a large number of people went out in vessels and boats to see the fight, fully expecting an easy victory for their side, but exactly the reverse took place.

Both the "Shannon" and "Weehawken" were considered smart ships, and they owed their victory in each case to the careful training the crew had received in gunnery. With *torpedoes*, such constant practice is not so necessary after the few officers and men required to handle them have once been trained. In a new ship a certain number of trial shots are required to determine the deflection and the best adjustments and impulse to be used, the remaining adjustments and keeping the torpedoes in good order are purely mechanical, and only require care to ensure being correctly made; all of which can be done before meeting an enemy.

The effective use of this weapon depends on the officer or officers stationed at the directors, who cannot be too well trained in allowing the few necessary corrections properly, but more particularly in determining on the best moment, or being able to take advantage of the most favourable opportunity for delivering his weapon, always remembering the length of time required in reloading that tube. Torpedoes should, therefore, not be fired at long ranges where there are small chances of hitting, if it can be foreseen that a better opportunity is soon likely to occur.

Practice in the Use of the Ram.—As regards this, it is evident that actual practice cannot be carried out with ships, but I venture to think that, if it is ever going to be used effectively as an important weapon in a ship, officers should be practised in its use, in either specially prepared gunboats or ship's boats, as practised in the Russian Navy some years ago, and recommended by Captain Fitzgerald at this Institution.

Captain Mahan sums up the necessity for training very concisely.

"The possibilities of the ram, for instance, are to be found in the consequences of a successful thrust; its limitations in the difficulties imposed by any lack of handiness, speed, or steering qualities in the ship carrying it; in the skill of the opponent in managing his vessel, and the weapons with which he is provided for counter offence.

"If these limitations are carefully considered, there will be little doubt how to answer the question as to the chance of a man, picked up at hazard, untrained for such an encounter except by years of ordinary sea-going, reaching his aim, if pitted against another who has at least given thought and had some professional training directed to that special end."

The following general questions appear to be necessary to consider before commencing with the special tactics to be adopted:—

Guns. Development of Guns.—The recent introduction of quick-firing guns and the gradual adoption of smokeless powder may have a great influence on the tactics to be attempted in the face of an enemy, and should briefly be considered.

Quick-firing guns, as their name implies, are able to deliver a larger number of rounds in a given period than other guns, and, as the secondary batteries of all new ships are being armed with them, the rapidity of gun-fire when ships are within range will be very great; this might at a critical moment have a great effect on the result of an action, and must be taken into account in handling a ship, so as to prevent an enemy being able to use his broadside guns when you cannot.

With this rapidity of fire great waste of ammunition is likely to occur, and the necessity for more effective control by the individual officers is even more than ever necessary.

Smokeless Powder.—The introduction of *smokeless powder* ought to prevent such a waste of ammunition, even that well-trained men are guilty of, viz.: firing when the enemy is not visible, owing to the smoke. It will facilitate independent firing being effectively carried out, and enable all the changes of range to be ascertained and the guns laid accordingly.

As regards a fleet action, it will be of the very greatest moment. Signals will (or ought to) be possible, which will allow such simple manœuvres as altering course together or in succession to be made, perhaps after the fleets are fully engaged; this will render the possibility of ships being held together and acting in concert after the first phase of an engagement, and increases the power of an Admiral to control his fleet, thus rendering tactics of greater importance than before, as, if one fleet got disorganized while the other was intact, the latter would score an immense advantage. There will be one disadvantage when using smokeless powder, that it will be impossible to hide any manœuvre by creating a large quantity of smoke.

Accuracy of Gun-fire.—With all the numerous improvements that have been made in projectiles and guns, the weapon is still directed and fired by men, who, although no doubt better trained, have not improved to any great extent, and consequently one must not expect such an increase in the percentage of hits as the mechanical improvements should give and are obtained on fixed ranges, where the gun can be quietly laid on a fixed platform at a stationary object. This is, no doubt, disappointing, but it applies to the torpedo and ram in a similar manner, although possibly to a less extent with the torpedo.

It is difficult to lay down the percentage of hits that are likely to

be obtained under favourable conditions; in a recent action, during the Chilian revolution, between the torpedo gunboats "Almirante Lynch" and "Almirante Condell" and the "Aconcagua," there were upwards of 990 rounds fired, and only 11 hits, all of which were in unimportant parts.

Admiral Colomb, I believe, allows 2 per cent. of hits between vessels under way, this result being based on previous actions, while other authorities consider there will be 10 per cent., which is probably about the number that should be made, provided fire is not opened at extreme ranges.

Necessity for a good Range-finder.—The main cause why there is such a small percentage of hits is owing to errors in elevation caused by a wrong estimation of range. If a reliable range-finder is obtained, the percentage should be much increased. This, I understand, is likely soon to be found, as there are several inventors trying to solve the problem.

Effective Gun-fire Range between Ships under way.—Taking an unprejudiced view of the probable accuracy of gun-fire, 3,000 yds. appears to be the maximum effective range in an action between ships under way, and, at present, when the range and bearing is rapidly altering, it would be better to reserve gun-fire until within 2,000 yds., to ensure a useful expenditure of ammunition.

Different opinions are naturally held on this subject, some gunnery advocates recommending a 4,000-yd. range, while others prefer the shorter range.

In special cases of chasing or being chased the latter range might be adopted for the heavy guns, when there is a full supply of ammunition.

System of Firing to be Adopted.—Broadside firing, due to the way guns are isolated from each other, has been done away with in most ships, thus removing a source of dissension as to its advantages or otherwise, and also when it should be used. This simplifies the question, and practically leaves independent firing as the only method to adopt, and, with efficient control, better general results will probably be obtained, although undoubtedly the effect of a broadside hitting might have been more disastrous to the enemy, but, as they did not always do so, there was a larger waste and a much longer interval between any shots being fired, whereas with independent firing a nearly continuous fire is delivered.

Owing to the increasing isolation of guns, rendered necessary to reduce the disastrous effect of shell fire, and the placing of them in separate casemates, more officers are now required to maintain effective control, as one should be stationed at each group of guns or in each casemate, if possible.

Projectiles to be Used.—This must depend largely on the manner the opposing ship is armoured; if completely so, armour-piercing projectiles are necessary, but if there are extensive unarmoured parts, shell fire would probably be most effective, as the main object of gun attack is to demoralize the crew, for which purpose it is best when there are a large number of men outside the armour protection.

No general rule can be laid down beyond the above, and the type of gun should be considered.

An action might be commenced with common shell.

Effective Torpedo Range.—From above-water tubes 450 yds. may be considered as the effective torpedo range between ships under way, while an extra hundred yards may be allowed from submerged fire. Within that range about 50 per cent. of hits ought to be scored, a larger percentage having been actually made in the different annual manœuvres.

Torpedo Arrangements.—After war has been declared, a torpedo should always be kept in each tube ready for firing at a moment's notice, the necessary arrangements for re-charging, &c., being made. Another torpedo should be kept handy if a protected place can be found. The above-water tubes, if not behind armour, should have an extemporised protection.

The tubes, if training ones, should be fixed on a certain bearing, one other alternative bearing only being used. The No. 1 of the tube should have thorough control of the tubes, and definite orders what to do in certain circumstances.

Preparations for Action.—On war being declared, all preparations should be made, as far as possible, so that on sighting the enemy, and the action bugle being sounded, there ought to be little more to do than to clear away and load the guns.

The preliminary preparations must depend on the type of ship, but in a general way should consist in trying to keep out the enemy's projectiles, or in isolating the damage they will cause if they penetrate, by extemporising further protection, removing all articles that are likely to cause splinters, such as wooden mess tables, &c., and all unnecessary fittings, filling the cofferdams, seeing all the ready magazines filled, and all arrangements made for the rapid supply of ammunition. There are various other preparations that should be made, but they do not seem to be required to be mentioned, as they are part of the arrangements of all ships, and do not directly affect tactics.

General Questions.—A few of these that have not, as far as I know, been settled, will be mentioned.

1. The *importance* of the ships of *a fleet being able to distinguish between each other* and their opponents. This is one of the dangers of a modern action, and one may expect to hear of great damage being inflicted by friendly ships. Each of the annual manœuvres tells the same story: the furious fire that in cases has been carried on between friends. This is undoubtedly easier to stop when firing blank, but when actually engaging might be much more difficult, and cause serious damage. This may not be considered likely to occur, but in a fleet action there is a great chance of friends being fired at by mistake, hence the necessity of a readily seen distinguishing mark, and it should be placed as far forward as possible, so that it may be seen at the earliest possible moment a ship's bow emerges from the smoke. Colours on a spar or a mast, placed as far forward as the guns will allow, might be one means, and painting different shapes on the

side might be found of use, these shapes being altered at stated intervals, to prevent the enemy copying them.

Position of *signalmen* in action, their means of working signals in protected positions, the necessity for having a system—one or more—that is likely not to break down, are of great importance.

Position of *the second in command*, and the means of being able to rapidly communicate with him in case of any casualty happening to the captain. This must vary in different ships, but is of great importance; in no case should he be stationed near the captain. In flagships the position of the Admiral, the means of his communicating his orders to the captain or the signal staff, has also to be considered.

Having dealt generally with the manner of using the different weapons, we will next consider in more detail the tactics that should be adopted to develop the maximum power of the ships at present in the navy.

Actions between Single Ships.

Before discussing actions between fleets and groups, I propose to take single-ship action first, as it appears to be simpler, and some of the principles laid down for single ships apply equally well for those between fleets, and need not be repeated.

In dealing with single ships, one must take the cases where vessels of different size and power meet at sea, as well as those of relatively equal strength; this makes a considerable number of cases which require discussion. In former wars it was only under very exceptional circumstances that a vessel not of the line could dare to cope with one of the line, but one of the peculiarities of these days is the power of comparatively small vessels, under certain circumstances, to be more than a match for large ones; thus the small torpedo-boat may sink a large battle-ship, and it must not be forgotten that a small vessel driven to extremities may round on her larger foe, and—though it would appear to be a forlorn hope—might, due to the weapons with which she is armed, destroy her.

This was never possible until the introduction of the ram and torpedo.

Different Classes into which Ships can be Divided.

The existing ships may be divided into the following classes, if their points of similarity are considered in preference to their differences, thus reducing the number as far as possible:—

1st class battle-ships.

(*a.*) "Royal Sovereign" and "Centurion" classes.
(*b.*) "Admiral" and "Nile" classes.
(*c.*) "Sans Pareil."

2nd class battle-ships.

(*d.*) "Inflexible" and "Edinburgh" classes.
(*e.*) "Dreadnought" class.
(*f.*) "Téméraire," "Alexandra," "Superb," "Neptune," and "Monarch."

3rd class battle-ships.
(*g.*) "Conqueror" class.
(*h.*) "Hercules" and "Iron Duke" classes.

Coast defence ironclads.
(*k.*) "Hotspur" and "Rupert."
"Glatton" class, "Orion" and "Belleisle."

1st class cruisers.
(*l.*) "Blake" and "Royal Arthur" classes.
(*m.*) Armoured cruisers: "Australia" and "Warspite" classes.
(*n.*) „ "Agincourt" and "Nelson" classes.
"Shannon."

2nd class cruisers.
(*o.*) "Latona," "Astræa," "Mersey," and "Medea" classes.
(*p.*) 3rd class cruisers and smaller vessels.

In an essay of this kind it does not appear desirable to particularise certain ships as the opposing ones, as it may reasonably be inferred that they may belong to any Power, and when one considers the various types possessed by the different nations, the task would be a very large one.

The various ships have therefore been broadly classed in five groups.

1. 1st class battle-ships of high speed.
2. 2nd „ „ of low speed, and rather out of date.
3. Small modern battle-ships of good speed.
4. Large cruisers, either armoured or unarmoured, but of high speed.
5. Smaller cruisers of high speed.
(Cruisers not able to maintain a speed of 15 knots are not considered suitable for war purposes.)

The 14 classes of English ships will be considered as pitted against each of the above groups, and the best tactics to be carried out discussed.

There is another case which ought to be considered, that is the tactics that should be adopted by a vessel, battle-ship, or cruiser which meets one or more torpedo gunboats, torpedo-boat destroyers, or torpedo-boats, on the open sea. I propose to deal with this when considering Groups.

First Case.—"Royal Sovereign" versus a First-Class Battle-ship of High Speed.

It will be assumed in all cases that the ship is prepared for action, guns loaded with common shell at first, speed to be adopted, the maximum that can easily be maintained under natural draught, which in this case is taken as 15 knots (at least). The officers have been informed, in a general way, of the captain's plan of action, how he wishes the guns and torpedoes fired, and then given considerable latitude in availing themselves of any opportunities. This seems very

advisable, particularly in a single-ship action, without any corresponding disadvantage of firing into friends.

The general principle of the action will preferably be to commence with an artillery duel, until the guns have done sufficient execution to render it desirable to close and use torpedoes, and, if necessary, or a favourable opportunity offers, the ram. The tactics the enemy is likely to adopt are difficult to foresee, as they will primarily depend on the relative power of the ships concerned, the national policy, and perhaps on the means of escape in case of defeat.

The "Royal Sovereign" would feel well able to cope with any other ship afloat, and, as our national policy is, if possible, to sink, capture, or destroy any of the enemy's ships that are met on the high seas, he must try and do this with the least risk to his own ship, otherwise no very appreciable gain will be obtained. It may, however, be accepted that, in our days, after a hardly-fought engagement, the victorious ship will not be of much further use for some considerable time afterwards.

The "Royal Sovereign," wishing to avoid an early ramming duel, intends to keep outside torpedo range at first, and steers accordingly, but tries to get within effective gun range as soon as possible. This will force the enemy to disclose his plan of action, and also prevent the possibility of his escaping.

On first making out the "Royal Sovereign" the enemy would also make his dispositions, so as to use his strongest weapon to the best advantage, and, broadly, may adopt either of three separate plans, viz.:—

1. Try to commence with an artillery duel.
2. Try to ram on the first opportunity, *i.e.*, on meeting.
3. Turn away, hoping by that means to escape.

Diagram I.—Shows the Beginning of an Artillery Duel.—(1.) Both ships have been assumed to have mutually adopted these tactics. R represents the "Royal Sovereign" and B the enemy.

The positions of the ships are shown at the end of each minute, they having been assumed just to have come within effective gun range (3,000 yds.) to start with.

R, while approaching, has been gradually edging away to keep outside torpedo range (say 1,000 yds.). B has acted similarly, and has been taking notice of R's movements, but, until R gets rather closer, is not certain whether he intends a ramming action or not.

They both stand on, until the other approximately bears abeam, when (*a*), they either mutually turn towards each other (as shown by the full lines) with a view to keep well within range, or (*b*), B may stand on (as shown by the dotted lines).

With the rapid rate that ships at this speed approach or recede from one another, it is important to turn as soon as possible, which condition would certainly be recognised by both ships, and (*a*) would probably be adopted by B (*i.e.*, turn towards R), in which case R at R_4 should steady his helm, as otherwise he would get too close at this early period.

At R_6, R seeing B still turning, should put his helm over to again close, and thus enable his secondary battery to be used, and, according to how much B turns, would turn more or less than 16 points.

B has been assumed to be equally anxious to continue the gun action at short range, but not to wish to ram; but if B does show any signs of wanting to ram, R has it in his power to ease his helm sooner and keep to port. This would make a quarter chase (somewhat similar to the relative position of B and R at $3\frac{1}{2}$ in Diagram II).

Assuming B acted as in the diagram, R would be justified in trying a shot from the starboard submerged tube (bearing in mind that at present no foreign man-of-war has a submerged tube), and that their above-water tubes might have been damaged.

The next manœuvre must now depend on the amount of damage inflicted by the guns, as it is possible that the guns may have done considerable execution to one of the ships, who accordingly would not be so anxious to continue engaging at such close quarters, and would not turn so soon. The other one could then turn and take the quarter position.

It therefore appears to be useless to try and trace the action any further, as it could only be pure surmise.

(*b.*) If B at B_3 did not turn, but kept on, R should complete his 16 points turn, and steer so as to get on B's quarter, and thus use his secondary battery as well as his foremost barbette.

This form of action appears to be more favourable to the chasing ship (particularly if a high free-board one), as any damage to the steering gear or propelling machinery would place the ship being chased in a dangerous position.

Before considering how the guns should be used, the second case, shown on Diagram II, will be discussed.

Second Case.—Enemy wishing to Force a Ramming Action.

Diagram II shows R and B 3,000 yds. apart. R intends to commence with an artillery duel, and has been steering so as to pass about 1,000 yds. from B. R, observing B at B_1 turning towards him (half a minute interval allowed for the other to notice the turning), R, at $R_{1\frac{1}{2}}$, turns 8 points to port to avoid B approaching too near him, and at $B_{3\frac{1}{2}}$, if B still continues following him, B exposes himself to R's starboard quarter torpedo tube, and, by a turn of R's helm, to his stern tube. Thus, at $3\frac{1}{2}$, B, assumed to be 360 ft. long, subtends an 18° target, and R would get a good shot at 310 yds. range, while B cannot possibly get one under 800 yds. which would hit R at R_1, but R then only subtends a very small angle, and is beyond the effective range.

B would probably have turned away 4 points at $2\frac{1}{2}$ to avoid this danger, having by this time seen that he would not be able to get a chance of ramming.

Thus R has forced a gun action by turning away in time.

B might, if he possessed a heavy right-ahead gun-fire, and chose

to ignore R's torpedoes, stand on in the hopes of disabling R's steering gear, and also possibly of overtaking him, but he would incur considerable risk, as shown above.

If, however, B does not turn away from R, R is awkwardly placed if neither of his torpedoes strike, which, considering the short range, would not seem to be probable.

In a case of this kind it is advisable to make an early use of these tubes, as they will be exposed to a heavy fire at a fairly uniform range.

In case of the above contingency, R would have to use discretion about turning to prevent B taking advantage of it, but should increase to his maximum speed, and gradually edge across B's bows, thus bringing his 6-in. guns to bear, and shaking B out of his wake.

Having traced the tactics that a ship of the "Royal Sovereign" class might adopt at the beginning of an engagement, it is advisable to take these two cases and see what opportunities the guns have had.

1st.—Diagram I.

Assuming fire to have been opened at 3,000 yds. :—

			Rounds.
R. Foremost barbette guns from R	to R_4	at one round every 3 minutes	4
„ „ „	R_3 to R_2	do.	2
After „ „	R_4 to $R_{7\frac{1}{2}}$	do.	3?
			9
6-in. quick-firing guns, 5 in. No.	R_1 to $R_{5\frac{1}{2}}$	at five rounds every 2 minutes	55
	R_3 to R_2	do.	12
			67

Smaller quick-firing guns should not open fire until the range is under 2,000 yds., which will be from R_1 to R_2, 8 mins. It is difficult to estimate exactly the number of rounds from these guns, but they will be very considerable—say from 14 guns, at 4 rounds per min. B would get the same opportunities, and the number of rounds would therefore depend on the armament.

Assuming 10 per cent. of hits for R, which ought easily to be obtained at such ranges, it would mean one from the 67-ton guns, and seven from the 6-in., besides probably 45 from the small quick-firing guns.

2nd.—Diagram II.

			Rounds.
R. Foremost barbette guns	R_1 to R_3	2	4
After „	R_3 to R_5	2	
6-in. quick-firing guns	R_2 to $R_{3\frac{1}{2}}$	17	
Small quick-firing guns.	All the nine, from R_1 to R_5..	224	

B. Foremost guns from B_1 to B_5.
Broadside „ perhaps at $B_{2\frac{1}{2}}$.

2nd. If B turns away at $B_{2\frac{1}{2}}$, both ships will be able to use their broadside guns.

R has the advantage in (1) as regards gun-fire.

Third Case.—Enemy Runs away.

In this case the enemy, directly he made out the "Royal Sovereign," and considered he was not able to engage such a powerful ship, has been assumed to elect to run away.

If both ships have an equal speed no possible result can be arrived at, but probably, in such circumstances, some desultory firing would take place in the hopes of getting each other's range; this must depend on the distance at which the enemy first made the "Royal Sovereign" out. It might be his plan to draw the latter towards some of his own ships, which, of course, would be guarded against.

If the "Royal Sovereign" did possess any excess of speed, he would be able to gradually reduce the distance, and eventually, if there is sufficient daylight left, would get within striking distance, and might be able to place his opponent in an awkward position, due to that excess of speed.

This is another case where a ship cannot be too careful when approaching torpedo range, as it should not be forgotten that from stern and quarter tubes, torpedoes can be fired before the antagonist is actually within torpedo range, and still strike the ship, as, during the time they are running, the ship is approaching to meet them, therefore, the greater proportion that the ship's speed bears to that of the torpedo, the longer the range; this, in the same way, increases the effective torpedo range on these bearings.

Having dealt with the different tactics the enemy may adopt, we will proceed with the next class of ship.

Secondly. "*Royal Sovereign*" versus *a 2nd Class Battle-ship of Low Speed and rather out of Date.*—The "Royal Sovereign" might with advantage adopt the same tactics as described above against a 1st class battle-ship. Owing to his excess of speed, it becomes a much easier task for him. The next question is, what would the enemy do? Lack of speed will hamper him considerably, and it will much depend on his gun armament and how they are protected. He will probably possess the advantage of a complete armour belt. Assuming his speed to be 12 knots and that of the "Royal Sovereign" 15 knots, the same three alternatives are open to him as in the former case.

1st. *Both Ships wanting to commence with a Gun Action.*—The "Royal Sovereign" would adopt the same tactics, but, having made the enemy out to be a weaker ship, but, probably due to the construction of those days, more completely protected, but whose armour is penetrable at 2,000 yds. with armour-piercing projectiles (he should load his guns accordingly), and at first try not to fight at too close a range, say, not within 1,500 yds.

Possessing a superiority in speed, he can always prevent the enemy escaping, provided in the first instance he had the hardihood to close, which would avoid a long chase.

A gun action would resolve itself very much into a fight similar to that shown on Diagram I, except that R would steer so as to maintain a longer range, taking full advantage of his excess of

speed and the extra penetrative power of his guns before coming to a close action.

2nd. *Enemy wishing to make a Ramming Duel.*—Plate III shows the case where the enemy B wishes to adopt ramming tactics. The possibility of this kind of action between two ships of equal speed is dependent on whether the other one desires it or not, and in no case can the slower one enforce it. Diagram III shows clearly the truth of this statement, as at 3, their distance apart is 1,130 yds., while if they continue on the same course in 5 mins. more, it is 1,440 yds., and so on, increasing each moment. R has the power of manœuvring round B, gradually edging across his bow, and thus bringing his broadside guns to bear all the time, as well as the barbette ones; if B persisted in continuing on that course, R would have a great advantage in bringing more guns to bear the whole time; if B edges away to starboard, the better R would be pleased, as he could take up a quarter position, which, due to his excess of speed, would also place B at another distinct disadvantage, particularly if B's stern or quarter-torpedo tubes are unprotected, as it would allow R after a certain time to approach nearer with less risk, and, if necessary, to ram B from abaft the beam, which is probably the best and only safe way to use the ram without being seriously damaged oneself.

No doubt an action of this kind might be considered by some to be a mean way of handling a powerful ship in the presence of a much weaker one, as it is against our traditional policy to ever show one's stern to the enemy unless absolutely obliged to by the force of circumstances; but it appears to me to be every captain's first duty to capture or destroy the enemy with the least risk to his own ship. To do so, he should be careful to use his superiority to the best advantage, which he undoubtedly would not be doing if he at once entered upon a ramming duel, where he would practically put himself on an equality with his foe, thus throwing away all his advantage.

3rd. *Case. He may Elect to Run away.*—The advantage of speed in a stern chase is obvious, and has been pointed out many times before, and was fully explained by the Prize Essayist in 1886, where the "Polyphemus" was shown diagrammatically chasing a slow-speed ironclad. This case requires no special remarks.

Thirdly. (*a.*) "*Royal Sovereign*" versus *a small Battle-ship of High Speed.*—This is very similar to the first case, and the "Royal Sovereign" might adopt the same tactics. It would probably resolve itself into a chase, in which case the "Royal Sovereign," due to her superior size, would in a seaway possess an advantage in speed, and might be able to overtake him.

The tactics to be adopted if a battle-ship meets a cruiser will be considered later on.

(*b.*) *A Ship of the "Admiral" or "Nile" Class.*—These ships being small "Royal Sovereigns," without, of course, many of the improvements that were able to be put into the larger and more modern ships, should be fought similarly to what has been described for that class. Owing to their low free-board forward, in deciding on a plan of action,

if possible, care should be taken to avoid, while actually engaged, to have to drive them against a heavy head sea.

Their action speed would be about 14 knots.

(*c.*) "*Sans Pareil*" *and* (*g*) "*Conqueror*" *Class.*—The special point about the armament of these ships is the undue prominence given to a heavy right-ahead fire, and unfortunately at the expense of sufficient stern-fire. The "Conqueror" and "Hero" are unfortunately rather slow, besides.

When they were designed, they were intended to be fought bows on to the enemy, and therefore tactics must be adopted to take advantage of their strong points, and to prevent the enemy doing the same with their weak ones. The peculiarity of their design is, no doubt, well known, owing to the prominence the "Victoria" disaster, has given this class, and one may naturally expect that an enemy will try to avail himself of it.

It has been shown on Diagram II that the only alternative one has if your opponent wants a ramming duel, and you do not, is to turn away at an early period, and then, if he still persists in closing, all you can do is to run away—this would be fatal with either of these ships.

Diagram IV shows how the "Sans Pareil" R would prefer to fight the action.

R has steered so as to get within gun range as quickly as possible, but when at 6,000 yds. distance, R turns away to pass well outside torpedo range, and also to try and keep his bow on to the enemy, then, if B allows that, R would adopt the dotted track. B probably, however, recognising R's weak point, will try and get on his quarter, and when at about 4,000 yds. distance, turns and steers towards R, R might stand on until she gets closer, and at 4, turn to starboard 8 points.

B, seeing this at 5, would probably turn towards R, and thus would get on R's quarter. R would thus be obliged to turn to port in self-defence, and the two ships would probably come within torpedo and ramming range, where we might leave them for the present.

These ships would have to adopt somewhat similar tactics against any modern battle-ship, but if the battle-ship was slower than either of them, they would gain an advantage and thus be able more easily to adopt their own tactics. If engaging a 2nd class ironclad, the weak stern fire might nearly be left out of account, and they could adopt somewhat similar tactics to those which have been advised by the "Royal Sovereign" class.

2nd Class Battle-ships.

(*d.*) "*Inflexible*" *and* "*Edinburgh*" *Class.*—The peculiarity of these ships is that they are armed with four heavy guns in turrets, placed *en échelon*, and they only have a very small secondary battery, the guns of which are much exposed, so that it is probable that, if engaged at close quarters, these guns would soon be rendered untenable. As regards protection, they possess a short, very heavily armoured citadel, and consequently long unarmoured ends. Their

speed is low, although that of the "Edinburgh" and "Colossus" is not so low; still, however, when compared with that of a modern battle-ship, is not sufficient.

Owing to their small number of guns, they would be placed at a considerable disadvantage if they engaged in a prolonged artillery duel, and as they are short, handy ships, the best tactics they can adopt, if they happen to meet a modern fast battle-ship, seems to be to close, and watch for a favourable opportunity to ram; here their speed will tell against them, and their opponent, if he did not accept this kind of action, would possess a great advantage, which would necessitate the utmost skill on the part of the captain to effect a ram. Unfortunately their torpedo armament is small and insufficient; still it is behind armour in all but one of them, and good use might be made of it.

They could not enforce a ramming duel, but, in the event of the enemy turning and making a running fight, they could make a good show, provided he had first come within effective gun range, as they would not be able to overtake him.

For an action of this kind (except as regards speed) they are well suited, provided they have not to be driven against a heavy head sea, as, owing to the turrets being *en échelon*, they can fire all four guns ahead, and the weakness of the secondary battery would not be so apparent.

If either of these ships met a battle-ship of their own date or earlier (*i.e.*, a 2nd class battle-ship of low speed and rather out of date), they could then engage on an equality, and, due to their better all-round fire and larger guns, would in all cases possess a great superiority; in which case it would be advisable to adopt the tactics laid down for the "Royal Sovereign" class, and the same three cases as to how the enemy might act would apply. The speed to be adopted would, of necessity, be much less, which would leave a slight margin for increase, if required.

(*d.*) *Second Case* versus *a 2nd Class Battle-ship.*—If one of this class met a broadside ironclad with weak "end-on" fire, they should use every endeavour to keep "end-on" to the enemy.

Diagram V shows an action of this kind. R having good "end-on" fire has a decided advantage, which he retains as long as he can keep bearing from B well before or abaft his beam. B probably knowing this advantage, if he does not wish to try ramming tactics, would, when he is within effective gun range, turn so as to bring his broadside guns to bear. R (if he feels his superiority and wants a decisive action) should turn also at 2, to try and get into an "end-on" bearing, by steering so as to take up a position astern of B, and make a running fight. B, while R is approaching, would be able to make use of his broadside fire, but if he did not turn at 4, R would gain the advantage he desires.

R, while he has been approaching, has presented a small target, whilst B has shown his broadside. B would, therefore, turn at 4, so as to try and keep his guns bearing. R might either keep on and turn, so as to either follow in his wake or just inside it, as shown at 5.

B would, when he gets to 8, probably turn to port again. R, having been thwarted in getting into an "end-on" bearing from B, would not gain anything further by following B, and might keep straight on, thus compelling B, if he wanted to continue the action, to turn and follow him, R, as the ships are separating, being able to make good use of his stern fire. If B did not, however, show any sign to turn, after a short interval, R could turn and chase B; B would have to prevent R following in his wake by turning to one side or the other, R being on the look-out to prevent B getting his broadside guns to bear.

In case B at first determined on trying ramming tactics, R would very rightly decline to accept them, and might turn away at 2. B would then be forced to chase R, if he wanted to continue the action, but if he did so, R would have him at a disadvantage. Therefore, it is possible that B would decline this, and the action might resolve itself into one at long ranges, unless R turned towards B again, when they had separated about 2,000 yds., R avoiding getting within ramming distance until he has crippled him.

(*e.*) "*Dreadnought*," "*Thunderer*," *and* "*Devastation*."—Somewhat the same plan of action laid down for the "Inflexible" class applies to these ships. These ships have no pretension to a secondary battery, as they are only armed with a few anti-torpedo-boat guns.

Their armament, therefore, consists of four large guns, mounted in two turrets, and two torpedo-tubes. The guns have good all-round fire.

They possess many other advantages, being very well protected, and are extremely handy.

If they met a 1*st class battle-ship*, probably owing to their handiness, good protection, and few guns, they should try and close, adopting ramming tactics, for which they are perhaps better suited than the "Inflexible" class, as it will be only the larger guns that can penetrate their armour, and they have no unarmoured ends.

If the enemy declined to close, and it became a running fight, they can only bring two guns to bear, which would render it a questionable policy, bearing in mind their low free-board, and that the enemy would be able to bring more guns to bear, but they would present a very small target, and could always turn and withdraw from this position, thus necessitating the enemy following, if he desires to continue the action, which he undoubtedly would.

These ships must not let the enemy overtake them too much, and should turn and try ramming tactics again when they see an opportunity.

If they met a 2*nd class battle-ship* they ought to be able to fight in any way they wished to. In preference, adopting the "Royal Sovereign's" tactics, and owing to their good armour, although they would probably have fewer guns than the enemy, but which would have superior penetrative power than his, they would render a good account of themselves in a gun duel with any ship of their own day.

(*f.*) and (*h.*) "*Alexandra*," "*Superb*," "*Téméraire*," *and* "*Sultan*."—The "Neptune" and "Monarch" may be considered more like the

"Dreadnought" class, except that they have very small actual right-ahead fire, and practically no right-astern fire, so they must always try and prevent an enemy getting in such a position as to bear less than about two points from their keel line, either ahead or astern.

The "Iron Duke" class and the "Bellerophon" may be considered as small "Hercules," but, due to their smaller guns, would not be able to make such a good fight as that ship. The "Bellerophon," having been re-armed with breech-loading guns, might (in moderately smooth weather) be considered as only just inferior to that ship.

All these ships are practically broadside ships, with various devices to get more or less good "end-on" fire besides.

Their guns are well protected, but are not separated enough to withstand modern shell-fire satisfactorily; they are built with a complete water-line belt, and altogether would stand a good hammering, except that, being mostly armed with muzzle-loading guns, at close range the enemy's small quick-firing guns, mounted in the tops and on deck, would do considerable execution, and materially interfere with their fire.

Therefore, if they met a 1st class battle-ship, and could not escape from him, it would be best to try and adopt B's tactics, shown (in full lines) in Diagram V, not allowing the enemy to get right astern, or to approach too close, in which case they would have to turn to meet the enemy in good time, as, owing to his superiority of speed, they might be placed at a disadvantage if he had overtaken them too much, and they had not room to turn.

If they met a broadside ship of their own day, they would be better able to choose their action, but should not approach too close for the reasons given above, and because all foreign ships of that day are practically armed with breech-loading guns, and most have had small quick-firing guns added since.

(*k.*) The "Hotspur" and "Rupert" are now called coast-defence ironclads, and may be briefly considered with the "Glatton" class, to which class the "Orion" and "Belleisle" may be added.

The tactics which these ships will adopt will entirely depend on the nature of the port or roadstead they are detailed to defend. It would, therefore, seem to be out of the province of this essay to consider their tactics.

This concludes the general tactics that are recommended for the first part of an action between the various types of battle-ships in our own and foreign navies.

In a few cases *ramming* tactics have been recommended at first, owing to the paucity in the number of guns which some of our ships are armed with, but in all it has been inferred that towards the end these tactics may be adopted. Therefore, it appears necessary that the method of using the ram should be mentioned. I do not propose to discuss it in detail, because there appears to be nothing very new I could bring out, and it has been dealt with by so many more able men. It is also a subject that theory, although most excellent to work upon, is of little use at the moment when eye, nerve, and

practice in handling a ship only will tell. It is probable that the result will depend more on the relative nerve and skill of the captains than on the manœuvring power of the ships, and the effect of a lucky shot at a critical moment may disturb all the previous calculations.

The following more or less accepted truths have been taken from different authorities:—

1. The ram can always be avoided by a vessel of equal manœuvring speed, provided the proper course is taken.
2. If two ships meet end-on, it will result in mutual disaster.
3. A ship inside another's turning circle is safe from being rammed, and is in a position to ram the other.
4. When being chased, never allow a ram to approach so close that there is not room to turn 16 points without meeting the ram. If you do allow this, your only chance is to steer a straight course, and trust to your torpedoes.
5. If you are overtaking an enemy, avoid keeping in the actual wake (for fear of torpedoes or mines); also beware of his quarter-torpedo fire.
6. If two ships are steering round the same circle, the faster ship may ram the slower one in the stern; or, if one has a smaller turning circle than the other, he can ram him on the quarter by steering the course inside his circle. In both cases considerable torpedo risk has been run.
7. The superior turning vessel, when speeds are equal, should never be rammed.
8. The faster vessel, when turning powers are equal, can always ram the slower one.
9. The faster vessel, if astern, has the advantage.
10. The faster vessel, when sufficiently ahead to turn, can force a ramming action.
11. If one ship is determined to ram, there are only two conditions open to the other: 1. To meet that ship on the same terms. 2. To turn away in sufficient time and make a running fight.
12. Speed is of greater importance to a ram than handiness.
13. While approaching to ram, guns should not be used, except by the express order of the captain. Smokeless powder may alter this, but further experience is required.

If one does want to adopt ramming tactics, one of the first questions which arise is: How shall I approach the enemy so as to accomplish my aim?

A great deal has been written on the subject, and Commander Bainbridge Hoff, in his book on modern naval tactics, quotes the opinions of a considerable number of naval writers on this subject, but in each case the enemy has been assumed to possess certain properties for the purposes of discussion, which is most useful in order to arrive at certain starting points, and thus to get a grasp of the theory of the subject, but the practical question is only partly solved, as, although one can plot out how to manœuvre—assuming a

certain speed and turning circles—still it is nearly impossible in such a practical subject to take note of the vast number of small differences in the handling of the vessels engaged, which will to a large extent influence the result.

Therefore, take the case of sighting a vessel on the horizon, of which you can find out about his guns, armour, and even perhaps his turning circle, while you are at a loss to know such important points as his *actual* speed of approach and what circle, if he turns, he will use, &c., also the tactics that he intends to adopt. His speed has an important bearing on the position you should commence to turn, as will be seen by Fig. 1, Diagram VI. Sir Wm. Dowell, in a lecture on naval tactics at this Institution in 1881, mentioned this difficulty, and pointed out that, owing to it, it will be difficult to estimate where the enemy will be when one has turned through eight points.

Owing to the general adoption of twin screws a threatened vessel has an increased chance of avoiding the blow, or, at all events, of making it a more glancing one; this same power is possessed by both ships, and is also very difficult to show accurately on a diagram, as it may be used at any moment.

Admiral Randolph recommended a ram to pass close aboard the enemy, exchanging broadsides, then to turn with the utmost rapidity across his stern, with a view to get inside his circle and be in a position to ram. This is no longer a plan that can be advantageously adopted, on account of the introduction and the development of stern and quarter torpedo fire; in fact, if you did try it, you would be nearly certain to be torpedoed by probably two torpedoes before arriving in this advantageous position.

There practically only remains the one method of trying to ram; that is, "on first approaching the enemy." This was shown in the 1880 Prize Essay; but, as will be seen by Diagram VI, there is a great danger of the enemy meeting you end-on, or, if she possesses a superior speed, of avoiding you altogether. Besides the above, if both ships intend to ram, and happen to have adopted the same plan, and assumed the correct speeds of each other, at the same moment both ships may put their helm over (see Fig. 1), and when they have turned four points they arrive at *a*. Now, if they both continue their turn, neither will attain his object, but if one reverses his helm (see Fig. 3), provided he has no stern torpedo fire, it would be advisable for the other to do the same, as the former will have come inside his circle, but if he has stern or quarter fire and does not reverse his helm he will be able to use it effectively during the time B is passing from *b* to *c* at about a 250 yds. range. If they both reverse their helm, they will pass each other at close range, but neither will have obtained any advantage.

Fig. 1 shows the difference that the relative speeds of B and R make in the bearing of B when the turn should be commenced. Thus, if R assumes B's speed to be 15 knots when it is really 10 (a large error has been taken to show more clearly its effect on the ramming encounter), when R would arrive at *x*, B is only at B_1; during

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DIAGRAM 1.

BOTH SHIPS COMMENCING WITH A GUN ACTION.

R. *Represents Royal Sovereig*
B. *Opposing ship.*

Speed of both ships = 15 *knots.*
Tactical diameter = 600 *yards*

The figures denote the position of both ships at minute intervals from **B.** *and* **R.**

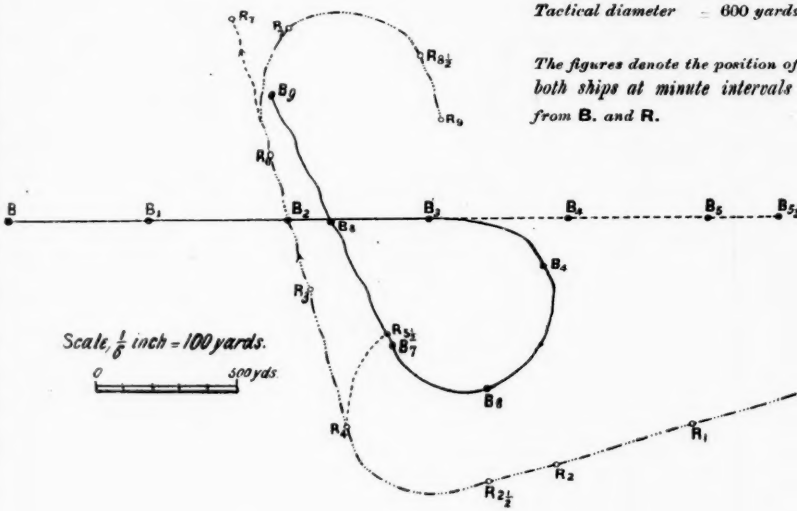
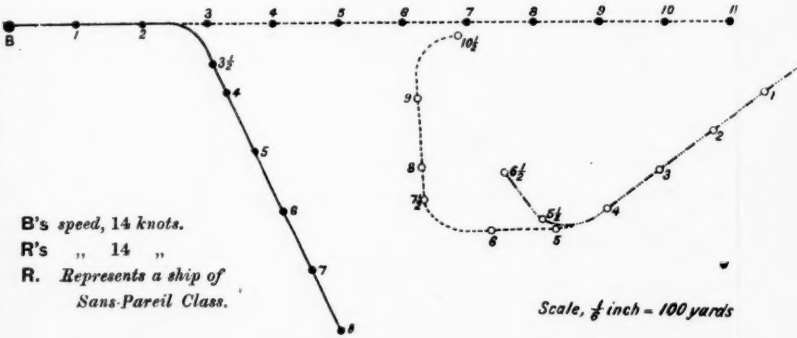


DIAGRAM IV.



oyal Sovereign.
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= 15 knots.
= 600 yards.

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DIAGRA

B. WANTS A RAMM

R. WANTS A GUN A

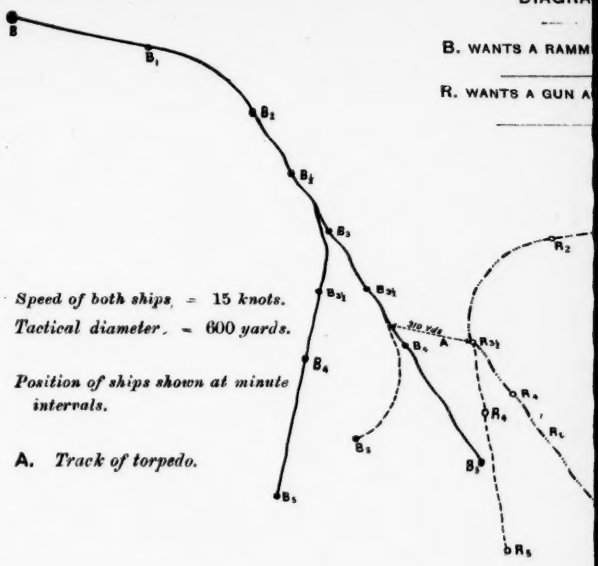

DIAGRAM V.

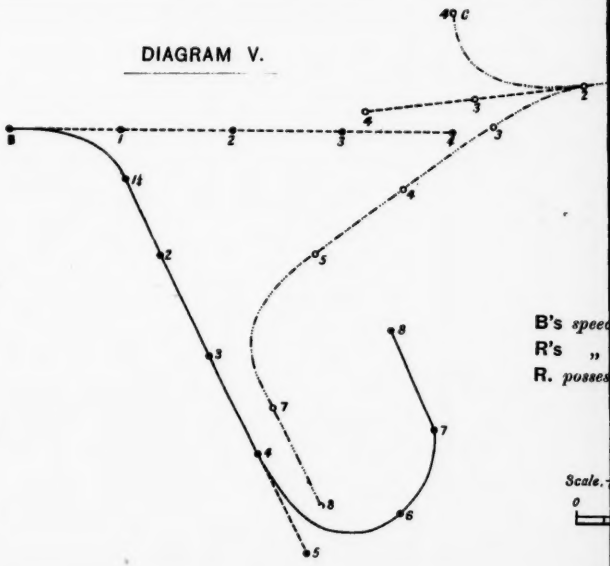

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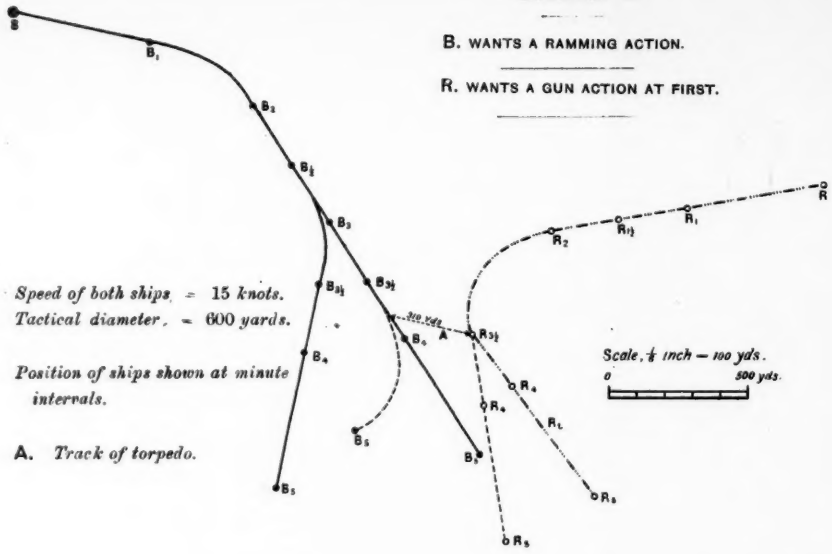
DIAGRAM II.

B. WANTS A RAMMING ACTION.

R. WANTS A GUN ACTION AT FIRST.

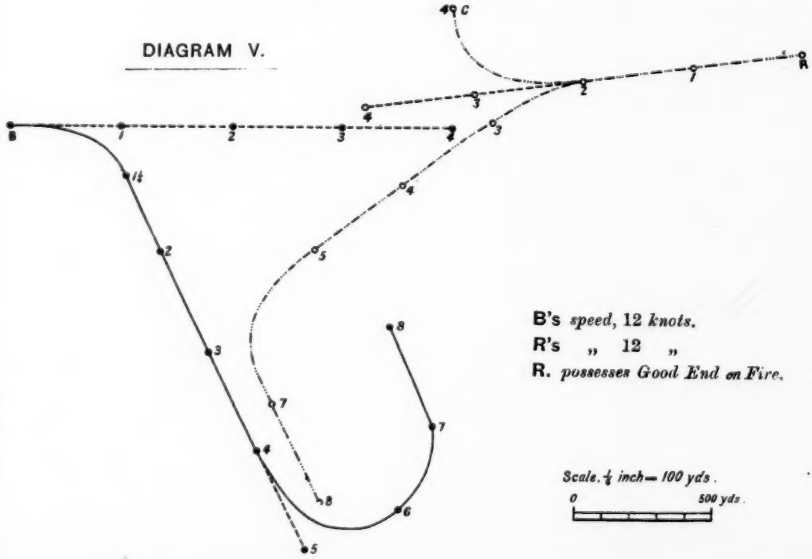


Speed of both ships = 15 knots.
Tactical diameter = 600 yards.

Position of ships shown at minute intervals.

A. *Track of torpedo.*

DIAGRAM V.



B's *speed*, 12 *knots.*
R's „ 12 „
R. *possesses Good End on Fire.*

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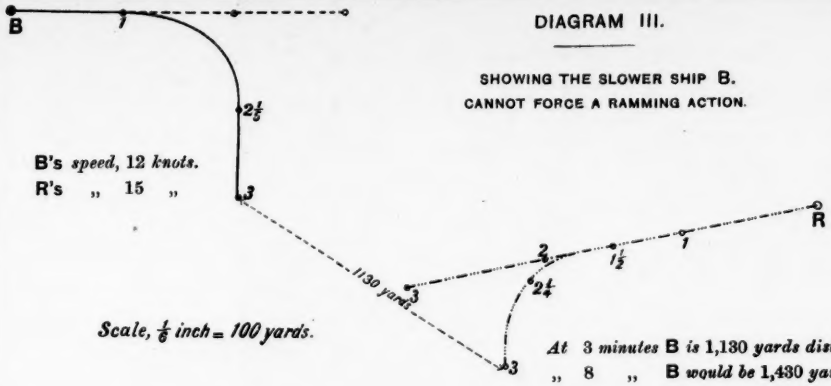
DIAGRAM III.

SHOWING THE SLOWER SHIP B.
CANNOT FORCE A RAMMING ACTION.



At 3 *minutes* **B** *is* 1,130 *yards distance.*
„ 8 „ **B** *would be* 1,430 *yards distance.*
„ 11 „ **B** „ 1,750 „ „

DIAGRAM VI.

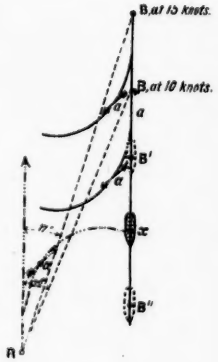


Fig. 1.

Speed of **R.** *is* 15 *knots.*
If „ *of* **B.** *is* 15 *knots,*
R. *must turn when* **B.**
bears 17° *and is* 1,280 *yards.*
If **B.** *is* 10 *knots.*
Ditto when **B.** *bears* 22°
and is 1,020 *yards.*

Fig. 2.

Speed of **R.** = 10 *knots.*
„ *of* **B.** = 15 „
R. *must turn when* **B.**
bears 14° *and* 1,660 *yards.*

Scale, 1/14 *inch* = 100 *yards.*

Fig. 3.

Both ships adopting same manœuvre at the same moment.

Their speed and turning circle being the same.

the turn he might be able to correct the error by easing his helm, but he will have to exercise caution not to get across B's bow, and if the error was smaller it might even be more serious, as it would not be so apparent. If B was assumed to be proceeding 10 knots, but instead of which he was going 15 knots, he will arrive at B″ when R is at *x*, in which case R could by no possible means be able to ram B, and will be compelled to pass under his stern, thus being exposed to his torpedoes. If R reversed his near propeller it would not help him to ram B, as, although it would reduce his circle, it would increase the time. Even assuming B to take no steps to prevent being rammed, the probable errors in estimating his speed complicate the manœuvre.

Now B, who may have been steering to pass close to R, either to take the initiative in ramming or to avail himself of any opportunity that offers, will be very much on the *qui vive* as to R's movements, and if R turns at a considerable distance off, he can easily avoid the blow, by either use of his helm, as shown in Fig. 1, or by slowing at once; this, however, reduces his manœuvring power for the next move, and might not be willingly adopted. If he turns towards R, he at once threatens an "end-on" encounter, which, if R did not allow much distance for turning, could not be refused. However, if there is space they may both continue their circle; neither ship, however, has gained any advantage.

Fig. 2 shows the disadvantage of only possessing or using a low action speed. Here R, if engaging a 15-knot ship, has to put his helm over at 1,660 yds. range, and B can refuse the encounter in nearly any manner he wishes.

In the above instances R has been assumed as having steered a course which the enemy has allowed, so as to pass just far enough off to allow him to turn eight points and to right his helm before colliding, this being considered to be the most favourable way of attempting to ram, but it is by no means a sure way. R would cover any movement, if possible, by opening fire (if he has any powder, that will cover his action).

The use of the ram towards the end of an engagement cannot be very easily shown, as it would be pure surmise to say how the ships will be placed, and a great deal will depend upon the ability of the other vessel to manœuvre, and thus attempt to avoid the blow.

The axioms which have been stated above may prove of some use in this case, as they point out certain positions to avoid; but, broadly speaking, ramming should not be resorted to unless some distinct advantage is evident, such as meeting a ship disabled, at anchor, or where one is in an inferiority as regards armament, or where one can bring a larger number of ships to bear on any part of the enemy's line.

"*Cruisers.*"

Cruisers will next be considered. I have divided them into five classes, but one of these classes (*n*) for a single-ship action may be considered the same as that of the older type of battle-ships, as all the ships in this class, viz., "Agincourt" and "Nelson" classes, and

the "Shannon," have always, until recently, been considered battle-ships, although the "Nelson" and "Shannon" are not so well protected as a battle-ship of their day.

The remaining armoured cruisers—the "Australia" class—may be grouped with the "Royal Arthur" and "Blake" classes, except that they have not such a good speed, otherwise the same tactics will apply for either class.

There are two general questions to be decided, viz. :—

1. (*a*) Can an unarmoured cruiser, even of higher speed, hope to cope successfully with a battle-ship?
   (*b*) If driven under force of circumstances, due to want of speed, or a partial breakdown of engines, to fight a battle-ship, what tactics should be adopted?
2. In what way ought actions between cruisers to be conducted?

It may be laid down as an axiom that cruisers were never intended to fight battle-ships, and, therefore, if possible, they should avoid them. This ought to be possible with any modern cruiser, but still there are some that do not possess such a high speed as the latest type of battle-ship, or that possibly could not maintain such a speed in a seaway.

In either case a cruiser would have to run away in case of encountering a battle-ship. This, I think, is the generally accepted idea, but, in the latter one, due to lack of speed, the battle-ship will gradually overtake the cruiser, and all the time would be pouring a heavy fire into him, which it is doubtful if a cruiser would be able to stand when the range was getting close. The cruiser would be able to return this fire to a certain extent, and might do some damage to the unarmoured ends of his pursuer, which will, if sufficient, have an effect on his speed, but this can hardly be reckoned on, and the cruiser's position will certainly be very uncomfortable, as the range would be well known, as it will only change so gradually. There is only one thing possible for the cruiser to do when the range gets, say, within 2,000 yds., that is, to turn and try to run past the battle-ship and use his torpedoes—his ram would be probably out of the question, on account of the small damage he would do a battle-ship with a complete water-line belt and the certain destruction to his own ship. If the ship was fitted with submerged tubes, they would be intact, and might be used effectively, provided the battle-ship allowed it, but one can hardly imagine the latter allowing such a manœuvre.

The cruiser would lose nothing by trying it, and might turn 16 points and steer so as to pass at 300 yds. range; the battle-ship would probably turn at the same time, or might wish to meet the cruiser with the ram. The first plan would be the wisest, as he would probably be certain of capturing the cruiser eventually, and thus need not run any undue risk. If the battle-ship turns also, all that is left for the cruiser is to resume his original course, and hope to be able to inflict some damage on the battle-ship; otherwise the former must surrender after having received a good hammering.

A *cruiser of high speed* could possibly do some damage if engaging

a 2nd class battle-ship of slow speed, but not well protected; owing to his superiority in speed and good armament of quick-firing guns, he would be able to choose his range, and get away in the event of his not being able to make any impression on the enemy. Armour-piercing projectiles should be used.

It becomes, however, a question of policy whether a cruiser should be used for this purpose, as it is quite probable that at certain times the cruiser would be far the more valuable vessel of the two, in which case such a doubtful action should be avoided.

Actions between Cruisers.—Cruisers vary perhaps more than battle-ships in size, and it may be taken for granted that a 2nd class cruiser could not engage a 1st class one on anything like equal terms, and therefore would have to avoid one by running away directly one was sighted; and the same thing would apply if a 2nd class one met a 3rd class cruiser. The latter could do nothing else but run away from the larger one.

Therefore, the only case that requires consideration is an action between two cruisers of the same class. For this kind of action the gun is pre-eminently the primary weapon, while the torpedo will exercise an influence towards the end of the action, and cruisers with submerged tubes will be able to close their opponent, not so fitted, with great confidence. The ram would not exercise much influence, on account of the severe damage the attacking ship would probably receive, although her opponent, if successfully rammed, would undoubtedly be sunk. It is more than probable that these facts would be recognised by both combatants, and they would steer so as to keep at about 2,000 yds. range (outside of the effective range of the small quick-firing guns), making the best use they can of their guns at that range. When they close they must expect the top fire of their opponent to play considerable havoc with their upper deck guns.

Tactics to be adopted in Fleet Actions.

Having discussed as fully as space permits the general method of fighting a single-ship action between the different classes of ships in our navy and those they may meet, I propose, before dealing with groups, to consider how fleets should be handled in the presence of an enemy.

Changes in the Composition of a Fleet since 1880.—It must have been apparent to every one the vast changes that have taken place in the composition of a fleet mobilized for war since that date. At that period they were almost solely composed of battle-ships; one reason may have been the lack of suitable cruisers to accompany them.

However, in these days no fleet is complete unless an attendant cruiser and a torpedo-gunboat or torpedo-boat destroyer is attached to every battle-ship, the main duty of the cruiser being to scout and give warning of the approach of the enemy, and that of the torpedo-boat destroyer to protect the battle-ship from attacks of torpedo-boats.

It is evident that a fleet of 12 battle-ships now imposes a largely

increased responsibility on the Admiral, as it will mean the handling of 36 vessels, whereas at the former period the same number of battle-ships would possibly have been unattended by any other vessels, and, as the enemy would be similarly organized in each case, the fleet of 36 vessels is relatively no stronger than one of 12 battle-ships was in the former case.

The increase in the number of vessels necessarily imposes an increased reason for adopting the simplest organization, but, at the same time, an efficient one, in order that the ships may act as a whole, and crush the enemy. Great flexibility is even more necessary, owing to the increase in the action speed, and therefore there will be less time to counteract any unexpected movements of the opposing fleet.

Improvements in the Mobilization of all Fleets.—Great strides have been made by all maritime nations in the rapidity which ships are mobilized and organized into fleets ready for immediate service. Besides which, most nations keep their ships in reserve at one or two important strategical positions, at the other ports there being comparatively few in number. This all leads one to suppose that, shortly after the declaration of war, fleets will proceed to sea to carry out certain operations. But even if this is not so likely in a war against us, a large fleet assembled at one port becomes a much greater standing menace than was the case in the Napoleonic wars, where the fleets were divided, and the strategical problem was for them to evade the blockading fleets, and join hands in order to strike the deciding blow.

This fleet will require watching by a superior one on our side, which will have to be constantly on the alert to prevent being taken at a disadvantage. It may be safely assumed that attempts will be made at certain apparently propitious times to disable part of our fleet. Or, as before mentioned, the enemy's fleet will proceed to sea to carry out certain operations. In either instance one may expect a meeting of the hostile fleets, and therefore fleet actions will by no means be so improbable as a few years since they were thought to be, besides which the strength of the contending fleets will be very great, so that it is necessary to consider the tactics for large fleets, and, if possible, adopt the same ones for smaller ones, thus avoiding complication.

The best fighting formation is a great desideratum, and no doubt occupies the attention of all senior officers as to which of the many they will adopt. I venture to think that it is of the utmost importance that experiments should be carried out with certain formations that are considered likely to be successful, pitting half the ships of a fleet against the other half, taking the necessary precautions to prevent accident. No doubt something of this kind, even with the action of one fleet restricted when the two halves get too close, would materially help to elucidate the matter. To commence with: great experience would be gained with steamboats, or, better still, torpedo-boats, as has been tried on some occasions.

The annual manœuvres have undoubtedly encouraged and directed

more attention to this vital subject, and have probably convinced those who had a vague idea that it does not materially matter how the fleets approach, as, in their opinion, after the first contact an action will become a *mêlée*, and who adopted Nelson's maxim, that every captain would be doing his duty if he placed his ship alongside one of the enemy's, which was undoubtedly true in his day, but, for reasons that are obvious, no longer holds good.

I cannot do better than quote Admiral Long's opinion on this subject, as expressed in his last lecture at this Institution in 1892:—

"Should a battle between fleets become, as it is sometimes said, a *mêlée*, in which every ship acted independently, it seems probable that many cases of involuntary damage to friends would occur; but it is difficult to contemplate such a scene of confusion as the result to disciplined forces of the effect of battle, unless the destruction of all leaders had reduced a fleet to a mere mob of ships. . . ."

But it should be remembered, that what we have gained by these manœuvres has also been gained by our possible enemies, who have also adopted similar manœuvres, so that the relative gain is more apparent than real. Before a fleet action can be considered, there are several subjects that require discussion, which may be summarised as follows:—

1. How the battle-ships should be organized, also whether the cruisers and torpedo-boat destroyers should be organized separately.
2. If sea-going torpedo-boats are available and sent with a fleet, how they shall be organized so as not to hinder the fleet.
3. What formation should the fleet adopt, and is it to depend on that of the enemy.
4. Position of cruisers and torpedo-boat destroyers in an engagement.
5. When cruisers, acting as look-out ships, should be recalled, and their duty on sighting the enemy.
6. Position of the Commander-in-Chief.
7. Which is to be considered the principal weapon to which the tactics are, if necessary, to be subordinated.
8. What speed is to be adopted.
9. General method of commencing an engagement.
10. Possibility of signals being visible after the engagement has commenced.

The foregoing queries embrace a good many of the points that have to be considered, and appear to be the most important.

1. *Organization of Fleet.*—It appears to be essential that the cruisers should have a separate organization to the battle-ships, and be under a separate commander, who should have liberty to act independently, obtaining as much protection as possible from the battle-ships while approaching, but they should be looked upon as a reserve, and be directed by him as considered advisable, their special opponents being the enemy's cruisers.

One of the torpedo-boat destroyers should be appropriated to each

battle-ship for action, the remainder, if there are any in excess, being formed into a squadron and placed under a separate commander, to act on the offensive, according to the general idea of the tactics the fleet are going to adopt. Those told off to the battle-ships for cruising purposes might also form part of this squadron, but at night when in the vicinity of torpedo-boats, or during an action, they should be stationed on one of the quarters of each ship—the "off" one for preference.

For the *battle-ships*, *three* should be considered as the unit, and the number of divisions and sub-divisions should depend on the number of ships there are in the fleet. Each sub-division consists of three ships—which should be organized to work together in case of the fleet getting into disorder—under the senior captain of the group; if this can be carried out, it would prevent the isolation of ships that is likely to occur, and, as it is understood that this system is adopted by, at all events, one other Power, it seems necessary to counteract it for self-defence alone; besides which, it possesses many advantages for offensive action towards the end of an engagement.

The leader of each sub-division should do his utmost to conform to the Admiral's movements, the other ships following their leader.

It is possible this organization may never be actually required, as it is hoped that the fleet will remain intact. The ships in each sub-division should be arranged so as to make the unit as uniform as possible, thus not putting all the best in one and the worst in another.

2. *Torpedo-boats* should never be attached to a fleet when cruising in the open sea, but, when operating in narrow waters, or in helping a blockade, they will be invaluable, provided there is some base they can return to about every third day. They must be looked upon as adjuncts, and might work with an attendant cruiser; the fleet should never be delayed in any way for them, and, as they are seaworthy, an Admiral need not concern himself about their safety, except in very bad weather, when they must seek shelter, but, even then, require no help from the fleet. If looked upon in this way, great use may be made of them, and if engaging a fleet coming straight from harbour with its attendant boats, their value would soon be recognized. Therefore their organization should be entirely separate from that of the fleet, the boats being under the senior officer, who again is under the captain of the cruiser. This allows them to act independently of the cruiser, if necessary.

3. *Formation of Fleet.*—Table D gives a list of some of the advocates for the different formations a fleet can attack in, and I have briefly given their reasons, which I hope are correctly stated.

This question is undoubtedly, with our small experience, still an open one, and in no case can it be expected that there would be an absolute concurrence of opinion. Each formation, as it may be seen, has its advocates, who are able to give good reasons for the opinion they express; most of them have been tested, as far as steam tactics can decide a point of this kind. It may be pointed out that perhaps what at one time was considered the best one by a majority of

officers, has, due to this experience, become discredited by many, and will probably never be again adopted in our navy. I refer to the group formation.

Another formation, *Indented line*, ahead or abreast, also has its advocates, and was adopted by the Red Fleet in one of the engagements in this year's manœuvres; but it has been condemned by many officers, as the ships are within their manœuvring distance, and would have to open out before they could change their formation. It lacks very much in flexibility, and its own great advantage is perhaps more apparent than real, viz., a clear gun-fire for all the ships. Now it will be seen that this is not the case until the enemy bears abaft the bow. Therefore I do not recommend it.

We have besides the above, line ahead, line abreast, quarter line, or some modification of them.

Line abreast and *quarter line* have been strongly recommended by some officers, particularly the former, and perhaps equally as strongly condemned. They possess many weak points, and I do not think either of them should be adopted, except in special circumstances, which will be mentioned later on.

Line ahead.—This, although not a perfect formation, is certainly the most practical, and the easiest for the ships to preserve station in; besides, due to its flexibility, a fleet can more readily counteract any movement of the enemy. It does not necessitate the use of the compass, which, as Admiral Long points out, may be shot away in action. There is a better all-round fire than with any other formation, right ahead and right astern fire only being obstructed, which can be very simply overcome if required. There is no danger of firing into one's friends, which no other one is free from; some of them, such as line abreast, are most dangerous in this respect. Signals are not required for altering course in succession. There is only one vessel that can be rammed in the line, *i.e.*, the last one, as, if any other is rammed, the next one astern rams her foe. The disadvantages of it are 1, weak right ahead fire; 2, difficulty of transmitting signals; 3, long length of line, which is likely to get broken.

1. Can be overcome if desired either by approaching a fleet in an angular direction, or by directing the second and third ships to keep a little on either quarter of the leader; this will allow them each to use their bow guns and increase the bow fire threefold.

2. This will be reduced with smokeless powder, but it still remains for cruising and action due to the smoke from the funnels. A repeating ship on the off-beam, which I believe was adopted in former days, would get over this difficulty to a large extent.

3. Is common to all single column formations.

Line ahead possesses another advantage, in that it is the easiest to form into from the now well established cruising formation, divisions in line ahead, columns disposed abeam, which in certain cases might be of great moment. This formation was the one the Italian fleet was in at Lissa, but that need not condemn it, considering the gap there was in the line, due to the flagship stopping for the Admiral to shift his flag, and the van ships still maintaining their speed. The

same fleet allowed the Austrian fleet to charge through their flank without in any way trying to prevent them doing so; in fact they went through the gap in the line. Therefore the failure in this case is not an argument against it.

As will be shown later on, different dispositions will be made, according to the formation the enemy attacks in.

4. *Position of cruisers* and *torpedo-boat destroyers* in an engagement. On the cruisers being driven in or recalled, they should form on the starboard beam of the Admiral, at 15 cables distance, in single column, line ahead. If there is a probability of that beam not being the off one, the leader should be told in good time to form on the port one. They should take all signals from their own senior officer, who will act as far as possible with the Admiral, altering course with him, but if they find, owing to his alterations of course, that they will be exposed to the fire of the enemy's battle-ships, they should turn 16 points together, or in succession to get on the off-side or astern of their ships, great discretion will be required on the part of the senior officer, so as to keep his ships well in hand, and yet not unduly expose them.

The torpedo-boat destroyers over and above those that are keeping station on the off quarter of each battle-ship should be organized in a squadron, and, according to circumstances, either form at 15 cables on the starboard beam of the Admiral, or the leader of the 2nd Division, from which even position they can attack most effectively.

5. Might be considered when describing a fleet action.

6. *Position of the Commander-in-Chief.*—I think it is the general opinion that the Admiral should lead his fleet, although in certain cases this has not been followed, still the more one considers an action between fleets at high speed, the greater are the advantages of his leading. The same remarks apply to the other squadrons.

7. *The Principal Weapon.*—Table C gives a synopsis of the opinions of different officers on this point. I lean very strongly to the opinion that the gun is the most important one at first, because, as in the case of a single-ship action, on account of its long range; but even more so of the danger of coming within torpedo and ramming distance without having first obtained an advantage over the enemy, and I would lay it down as an axiom that no fleet should risk a close encounter (at first) without having obtained a tactical advantage over the other one, as otherwise it becomes a matter of chance what will happen on a charge being made, supposing both fleets are equal and in similar formation. Probably they will have crippled each other without having obtained any superiority over the other. Therefore, while trying to outmanœuvre him, the best advantage should be made of the guns, in order to disable one or more of his ships.

Captain Mahan arrives at the following conclusions, after his comprehensive study of naval history:—

"That a fleet seeking a decisive result must close with the enemy, but not until some advantage has been obtained for the collision, which will usually be gained by manœuvring, and will fall to the

best drilled and managed fleet. In truth, barren results have as often followed upon headlong close encounters as upon the most timid trifling."

Fire, as in *single actions*, should not be opened before the range is 3,000 yds. and under, except in the case of a chase where the range does not alter rapidly, when a greater range is permissible, considering the number of ships there are to hit.

8. *Speed.*—The highest possible, being guided by that of the slowest ship, which should be allowed a reserve of 1 knot.

9. Will be considered when discussing a fleet action; the general principles have already been dealt with.

10. Possibility of signals being visible after an engagement has commenced.

This is highly important, and undoubtedly a fleet which possesses a system by which a few simple signals can be made, even in the height of an action, would be much superior to one which has not that means.

Whether this will ever be possible, experience only can determine; but with the introduction of smokeless powder, the question requires being again considered. As with fleets moving at a rapid pace, and the conditions changing momentarily, opportunities will undoubtedly occur which, if the Admiral could take advantage of them by making a simple signal to his ships, might be of immense advantage.

Being able to take in signals simplifies the question of keeping the fleet intact, and would be of immense value in case of the ships getting separated, as the first fleet which gets disorganized is very liable to be the one which will be defeated; at all events it is placed at an immense disadvantage.

The formations which the enemy's battle-ships may be in are various, but they may be summed up generally in four classes:—

1. Single line ahead.
2. Divisions in line ahead, disposed abeam. Groups in line ahead. Indented line ahead.
3. Single line abreast. Line of bearing, or quarter line.
4. Divisions in line abreast, disposed astern. Groups or pelotons in line abreast. Divisions in quarter line, disposed astern. Indented line abreast.

It will be difficult on first sighting an enemy to determine what his formation is, but on an ordinary day this ought to be possible at a distance of five miles; still, one does not even then know whether that is the one he intends to fight in. On first sighting him, it will, however, be readily seen whether he is in a broad or narrow front formation, and preparations can then be made to suit either of these formations, or any modifications of them. If this can be devised, it simplifies the problem considerably.

Enemy in Narrow Front Formation.—(a) *Single line ahead.* Diagram VII shows a supposed engagement between the two fleets. To simplify the explanation, we will suppose the enemy has been reported

by the look-out ships, which have been able to count the number of his ships and to tell roughly their formation. Our fleet, which we will call *R*, has been formed from divisions in line ahead, columns disposed abeam, to single line ahead, the fighting formation, the flagship has shaped the required course to meet the enemy.

The look-out ships having done their work have been driven in or retired, and have taken up their position 15 cables on the starboard beam, and have been given their orders to act independently and as a reserve, but to get whatever protection that is possible from the battle-ships.

Now comes the question—How shall the battle-ships attack when both fleets are in the same formation? If they meet and charge each other or pass along each other's line, all other things being equal, there is no gain to either side. It would be unadvisable to attack in any other formation, as we would be giving an advantage to the enemy; the only way is to try and manœuvre so as to bring a stronger fire to bear on some part of his line than he can reply with. This may possibly be done in several ways provided he allows it. One is shown in the diagram, which seems about the most feasible; that is to steer so as to pass about 1,500 yds. off, when abreast. When at rather over 2 miles (4,400 yds.), the divisional leaders turn 8 points to starboard together; the remainder, in succession; fire being opened by the leader of the line just before turning, so as to cover the movement, and, as the leading division turns, fire to be opened from the large guns and secondary battery at the enemy's leader, with a view to crippling him; then (1) assuming he continues his course, which he might do at first in the hopes of being able to cut through R's line when at B_2, his position would be a trying one, but R is not going to allow him to cut through his line, so turns together 8 points to starboard, thus getting into the retreat formation. R_3 shows their relative position. When R has completed the turn, B's leader has had the broadside fire of six ships on him, and now, if he continues, has the stern fire of the same number of ships. Besides, R's torpedo flotilla can be used with great effect against B's leading ships, and this is one of the cases where fast torpedo-gunboats or boats could do considerable execution before receiving much injury, or being prevented by the enemy's catchers, as their speed of approach is the sum of their own speed and that of the enemy. R in the position shown at R_3 can assume the offensive whenever he desires, by turning "together" to port or starboard, and can re-form line ahead readily if he wishes to.

(2.) It might rightly be considered that B would not allow himself to be out-manœuvred as has been described above. He has two alternatives, and still can continue the action without any disadvantage:

(*a*) *By Turning to Port* 8 points he arrives at 2*a*, when R is at R_3; (*b*) By turning to starboard with a view to rake R's line from astern. In (*a*) the engagement would become a gun action, the two fleets in single line ahead, as R in this case would not turn to R_3, but would signal: "Form Single Line Ahead."

It would be R's policy to reduce speed so as to let B go ahead, and then to turn in succession and charge through the rear of B's line in either single line or in divisions. B, to save his rear, would have to turn together and form in line abreast either towards R or in retreat. If he turned towards R, R would have what is considered the advantage of attacking a line abreast formation in line ahead; if he turned away he would be following R's first manœuvre, which would necessitate R turning back 8 points in succession, and resuming the course shown at R_2; then, when all his ships are formed in line, he could turn 8 points together to port, and follow B in the same formation as B is in. There being no other way of chasing a fleet in line abreast without suffering severely, than in the same formation, B now can resume the offensive at his pleasure, R watching his movements closely to form in line ahead directly he shows any sign of so doing.

(*b.*) *By Turning to Starboard.*—R in this case should turn to port as shown at 2, and turn in succession trying to cut off B's rear ships, R's leader taking the rear ship, the next one the last but one, and so on; in this case R's rear is safe from a counter-attack. And, perhaps, if B allowed it, the last three ships would be placed *hors de combat*.

But it may be supposed that B's rear ships, knowing their danger, would increase speed, and get up on the off quarter of the others; R has not lost anything, if the attack fails, as he would have brought a heavy fire to bear on B's rear. B would have to take the next initiative, otherwise the action would remain a desultory one, the head of R's line barely reaching the rear of B's line.

We will next take the case of the enemy, B, in line abreast, or some modification of that formation.

Enemy in Line Abreast.—Diagram VIII shows a case of this kind. R's tactics are not to approach at right angles to the line, but at any other angle, so as to strengthen his right ahead fire; and to pass on one flank of the fleet just outside torpedo range, then to turn towards the fleet in succession and rake the ships. He considers his formation a stronger one than the enemy's, and if the latter prevents him passing to his flank, he accepts, charging through the latter's fleet, in preference to prolonging the first part of the engagement by turning away.

It may be noticed before proceeding any farther that by many foreign authorities this formation was considered the best for *rams*. I am not sure whether that is generally accepted. Individually, I fail to understand the arguments in its favour, but since the introduction of seagoing torpedo-boats and torpedo-gunboats, it seems to possess greater advantages than any others for protecting these vessels until within striking distance, the ships then turning, and the boats attacking the head of the enemy's line under cover of their fleet's fire. If this is not done, any ships which penetrate this line will be exposed to the attack of these vessels, and if it is determined to close and do so, it will be essential for the leading ships to be supported by a flotilla of torpedo vessels to protect them against this

form of attack. R accordingly approaches, as shown in the diagram, and, if B allows it, will pass outside B's starboard wing-ship, thus bringing an overwhelming fire to bear on that ship. It has been assumed B will not permit himself to be outflanked, and turns to starboard together to prevent it. R can turn in succession to port, and the action will then develop into a gun action; both fleets being in single line, no advantage will accrue to either side, other things being equal.

R, however, still persists in charging B's fleet, and seeing that he cannot outflank B from the position he is in, if the latter does not wish it, he accordingly determines to charge through B's line. B, if he has decided to meet him, will have to turn to port at 4, so as to receive R's attack in line abreast. The leading ship of R's meets B's line between 6 and 7, and will try and pass between B's third and fourth ship, possibly trying to ram one if he sees the chance, but for preference avoiding ramming and keeping his ship intact as far as possible to lead the line. As he passes he will be able to use both his broadsides, and each ship, following to do the same, will produce a fatal effect on these two ships, and possibly their neighbours. R's leading ships have, however, been exposed to a very heavy fire in approaching, and will have received considerable injury. However, his hope is to be able to stand on through the line, and then turn either way under the sterns of the ships and continue the action. If he is unable to do this, the next one should have directions given him beforehand what to do; he would thus lead the fleet, the leader trying to keep with them as much as possible. Directly the head of the line is through the fleet, the torpedo vessels would attack them; this must be met by R's boats, which should try in passing through B's ships to make good use of their torpedoes and ought to avoid firing too many torpedoes at the same ships.

R's rear division should try and pass between the two next ships, the leader turning in the same way as R, directly he is through, thus forming into divisions, as shown, and by that means keeping in closer touch with B's ships. R has been shown turning to port to try and injure the remaining ships of B's starboard column.

B's port column has not been shown as supporting the ships attacked, and I do not remember ever seeing this recommended. It is also next to impossible for them to help, even if they turned to starboard directly R's leading ship commenced the charge; the turn would take nearly two minutes, and then, to be of any good, they must form under the stern of the other half of the line, which would take about five minutes, and two more to turn up, making nine minutes altogether, by which time R would be well through the line.

In an engagement of this kind it may be inferred that R would have gained a considerable advantage and caused more loss to the enemy than he has received. His fire has been free from hurting his friends the whole time—both from guns and torpedoes—and the few ships of B's line engaged would have been exposed to the fire of both broadsides of 12 ships, while R would have only received the right ahead fire of 12, which he could return to a great extent.

As R's ships pass through, all B's shots, if they miss R, will be probably poured into their friends, unless the strictest care is taken to prevent firing on beam bearings.

There is, however, one very uncertain element in this attack; that is, what effect B's boats will have and whether R's would be able to prevent them approaching near enough. It can only be really determined by actual war, but might be tried as far as possible by experiments, as it is of the very greatest importance to know how to protect the ships from this danger.

Enemy in Divisions in Line Ahead, Disposed Abeam.—Again, R's plan would be to pass outside B's outer division, and thus oppose one of his lines with the fire of the whole fleet, and then turn under the rear of B's lines.

He might be able to attain this if, on first sighting B, he steered so as to pass well clear of him, not closing until he had got at such a distance off that B could not prevent this without turning more than 8 points. This is shown at R.o., but might not be possible with a vigilant enemy. R shows what is more likely to be the position, although R, even at R, could alter course together to port and still try and attain his object, but he would expose his leading ships, and, in fact, the line, to a heavy fire. It will be attempted, instead, to show that R can obtain an advantage by passing through the lines if he only singles out one of the divisions and directs his whole attack on that one—as shown on Diagram IX—in which case B's port column is the object of R's attack, who intends to direct a heavy gun and torpedo fire on that line while using his other broadside at the other line, and then, say, his three leading ships to turn and ram the rear ones of B's division. R's 2nd division passing along the other beam of this same division of B's fleet and completing their destruction, B's other division could not well turn until at 4, as he would not know R's object, and then, if R's 2nd division turned, as shown, could not effect much in supporting his other line.

If B is in three divisions, R would possess a greater advantage over him.

The effect of the torpedo-boats on either side would be about the same, the fleets being both in line ahead formations.

Enemy in Groups in Line Ahead.—The peloton form of group has been taken, as it is more highly recommended than any other by foreign officers. See Diagram IX.

In this case, R, recognising that B is in a good attack or defence formation, provided his ships are in station, and that therefore no advantage would be gained by a close encounter too early, has resolved to turn away when he is within effective gun range and maintain a gun action, trying to obtain an advantage for this form of engagement.

In this formation B's fire is considerably restricted on certain bearings and his ships offer a better target than R's, being practically three deep; therefore it is assumed that R has a decided advantage in a gun action, as R's fire is quite free, except right ahead and astern.

R, at R, turns to port in succession, and thus brings the broadside guns of his ships to bear on the head of B's line. B cannot force a ramming action in this case, and, if he continued his course, would not gain any advantage, while if he turns to starboard in succession he may hope to be able to close and force a close encounter with R, which might possibly be his object.

R can, however, avoid this by turning together to port 8 points or less.

The relative positions of the fleets are shown at 11; R has been closing to get more ahead of B, and in order to avoid crossing B's bows will turn to starboard, thus steering a parallel course and forming in a slight quarter line formation, which formation he should maintain until he has disorganized B's line, to hasten which he might direct a torpedo-boat attack on B's outer ships, which would probably succeed to a certain extent, while B could not make a counter one with the same chance of success.

In discussing a matter like this, only the beginning of an engagement can be traced, as after that it is most difficult to follow with any certainty what will happen; general plans for the various possibilities only can be laid down, and no attempt has therefore been made to trace the latter part of an action.

Still less can the effect of the torpedo flotillas be traced, as so little is known of the probability of hitting these craft, or how to use the torpedo-boat destroyers effectually against them. Both of these points have formed a fruitful source of discussion between torpedo-boat advocates and their opponents for some years.

A torpedo-boat attack late in an action stands a very good chance of being successful on account of the probable disabled condition of quick-firing guns, more particularly the upper deck ones; still, if the boats have been accompanying the battle-ships in both fleets they are equally likely to have been disabled.

Enemy in Indented Line Ahead.—Similar tactics should be adopted to the one described above for "Groups in Line Ahead."

Enemy in Indented Line Abreast, Groups in Line Abreast, Divisions in Line Abreast, Columns Disposed Ahead.—An attempt should be made to outflank the enemy. If this fails, it is doubtful whether any advantage would be gained by charging at once, as neither of these formations possess the weak points of "Single Line Abreast."

Therefore, it would probably be better tactics to manœuvre first for a gun action by turning in succession in the same direction you have been trying to outflank the enemy. By this means, at first, you will bring the fire of your whole fleet to bear on part of his, which, of course, he will correct as soon as possible. The action will become somewhat similar to the one shown on Diagram IX.

Enemy in Quarter Line.—An attempt should be made to attack the rear flank ship, the fleet should be steered for the centre of the line, and then turned off for that flank. By this means you would bring a good fire to bear on the rear of the enemy's line, and might, if allowed, penetrate that line with success.

The enemy could prevent this by turning either way, in which case

you would have to alter course accordingly, and the action would remain a gun one.

The above embraces all the cases of formations which the enemy may be in.

In all these cases, the speed of the fleets has been considered equal, and also their turning circles. No account has been made of the type of ships which compose the fleet. A ship's peculiarity naturally gets lost in a fleet or collection of ships. Therefore, there is not the same necessity to consider each separate type; but of course the composition of different fleets will vary considerably, still, it is an essential principle to make each fleet as homogeneous as possible, and owing to the recent policy of building several ships of the same type, the organization to attain this object has been facilitated, and it has become the ruling policy when relieving ships in our principal squadrons.

So that we will possess two fleets of modern ships, a reserve one of not quite such modern ones, and a still further reserve of all the older vessels; these vessels will be principally required to fill up gaps in the fighting line after an engagement.

The Tactics of a slow fleet will differ to some extent as a consequence of their lack of speed. As more time will have to be allowed in completing an evolution, more room will, therefore, have to be taken if it is intended to make any change of course, &c., while approaching. This of necessity will hamper the movements of the slow one, and more caution will have to be observed.

In commanding a fleet of older battle-ships with weak end-on fire, care will have to be taken to keep the enemy bearing on the bow. Such close range should not be adopted on account of their guns being muzzle-loading, and the effect of the enemy's quick-firing guns while loading, &c., which has been mentioned before. With these exceptions, the general method of commencing an engagement will be similar.

The action speed in the diagram has been taken at 12 knots, but a higher one should be adopted if possible, say, 14 knots; while for the fleet of older ships a speed of at least 10 knots should be adopted; it is obvious that a good speed means a great advantage in an action, also an advantage in speed allows more effective tactical combinations to be made.

In the above, we have assumed the enemy to have the same number of ships and to be equally desirous of fighting; this may probably be more the exception than the rule, as it is improbable that equal fleets will always meet, and, even if they do, there will not usually be the same desire to fight on both sides.

We will now take the case of an enemy who, on sighting our fleet, tries to escape. The issue will then depend on the probability of ours being able to overtake it.

The cruisers will be sent ahead at once, and the fastest battle-ships to support them, the remainder following as fast as they can.

If the fleet is sighted late in the day, and at some distance off, there will not be much chance of coming up with it before dark, in

which case the expenditure of fuel that it will involve in what will turn out to be a fruitless chase may be a consideration.

But, assuming it to be early in the day, and that our ships are overtaking them, the enemy would probably remain organized in formation, which would possibly be line abreast, with the cruisers astern at first, trying to drive off the others, but, on the approach of the leading battle-ships, these will have to seek a longer range.

The chasing ship will have to form into some formation when approaching within effective gun range, and might assume line abreast with the cruisers on each flank in quarter line. The action will remain a gun one, but the chasing fleet must be prepared for the enemy to take offensive action at any moment; no doubt their cruisers will continually try to shake off their chasing foes. Or even if the battle-ships see an opportunity, they may turn and attack the leading ones which are chasing them, in the hopes of being able to overpower them.

Or an attack may be delivered by their torpedo-vessels, the probability of an attack of this kind being successful in the daytime if there is a large gap between the fleets is not great, and the chasing ships can always turn and keep these vessels longer under fire, in the hopes of destroying them before they get within striking distance.

An attack of this sort, even if only a feint, may hinder the chasing ships, and thus allow the other fleet to increase its distance.

If the chasing fleet has its torpedo-vessels with the advanced line, they may be sent to the front to ward off the attack.

Night Actions.

In all the above cases the engagements have been assumed to have taken place in the day time, but in these days of steamships, there will probably be many instances in which fleets will meet during night time; they will mostly occur during blockades, or where one fleet is guarding a certain channel or passage. In each case, the general rule will be that one fleet is trying to elude the other, and is taking advantage of the darkness to attain its object.

There will be a few instances where the blockaded fleet has got sufficiently strong, and hopes to be able to drive off the other one, or inflict a considerable loss to it by attacking at an unexpected moment.

In either case, probably any foreign nation possessing a large mobile defence of torpedo-boats would send out a cloud of these boats to cause confusion to the other fleet, and possibly considerable loss, if the ships are maintaining a close blockade; this attack being followed by either a determined one with the battle-ships, or the latter trying to take advantage of the confusion, and escaping.

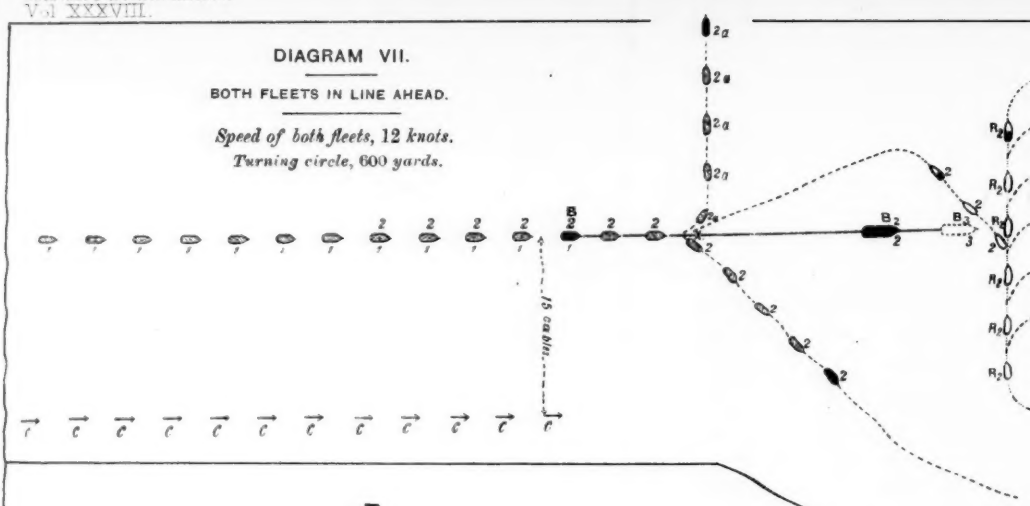
In the former case, they will have the advantage of being in a compact formation while their opponents are scattered, and would have to call their ships off to form.

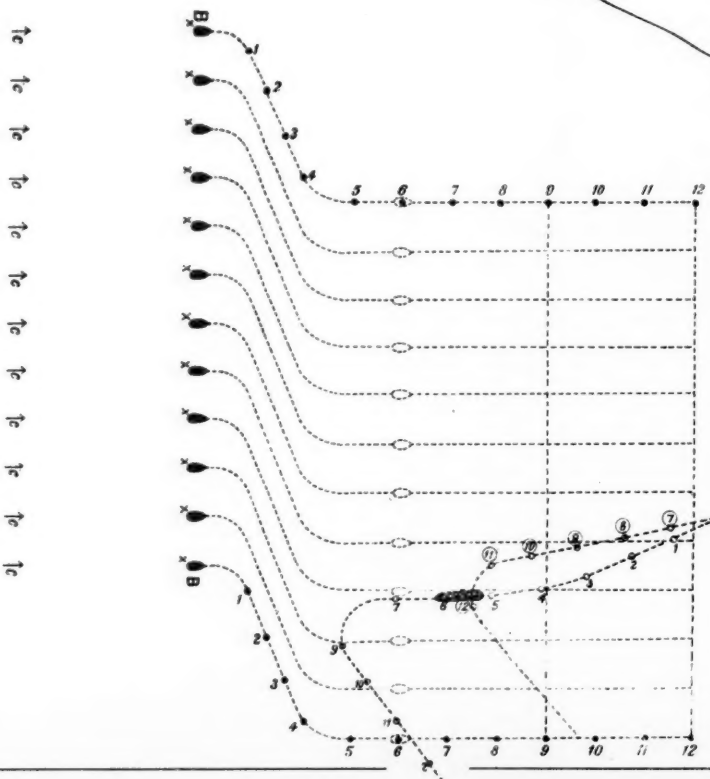
When formed in single line ahead—in which formation it is very

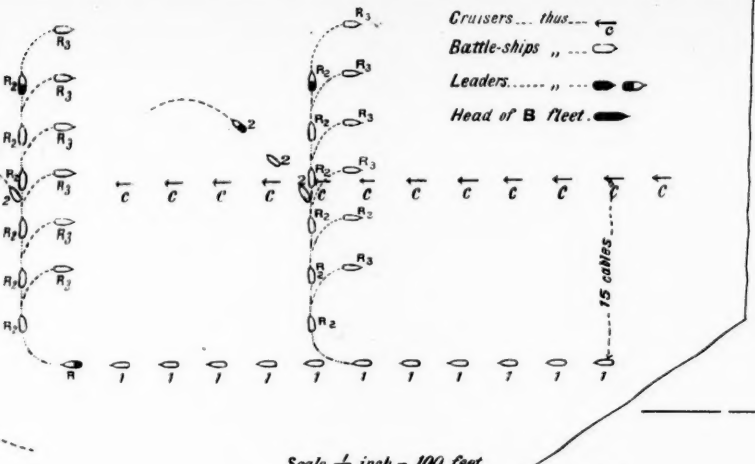
DIAGRAM VII.

BOTH FLEETS IN LINE AHEAD.

Speed of both fleets, 12 knots.
Turning circle, 600 yards.







Scale, $\frac{1}{14}$ inch = 100 feet.

DIAGRAM IX.

ENEMY IN PELOTONS.

Speed of both fleets, 12 knots.
Turning circle, 600 yards.

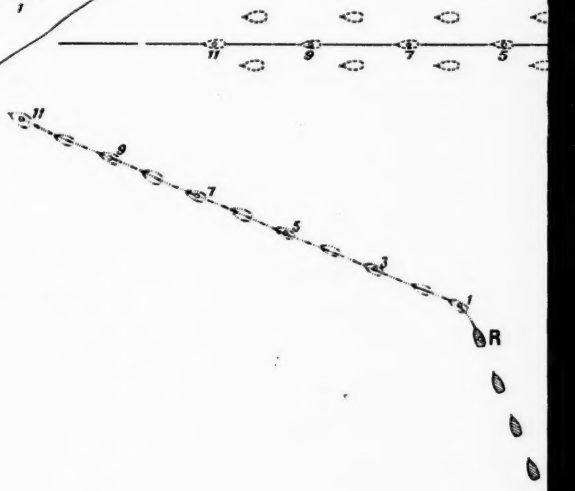
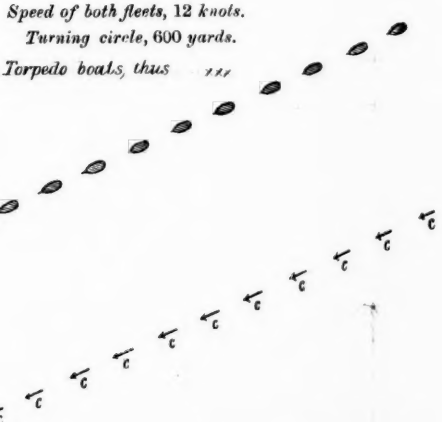


DIAGRAM VIII.

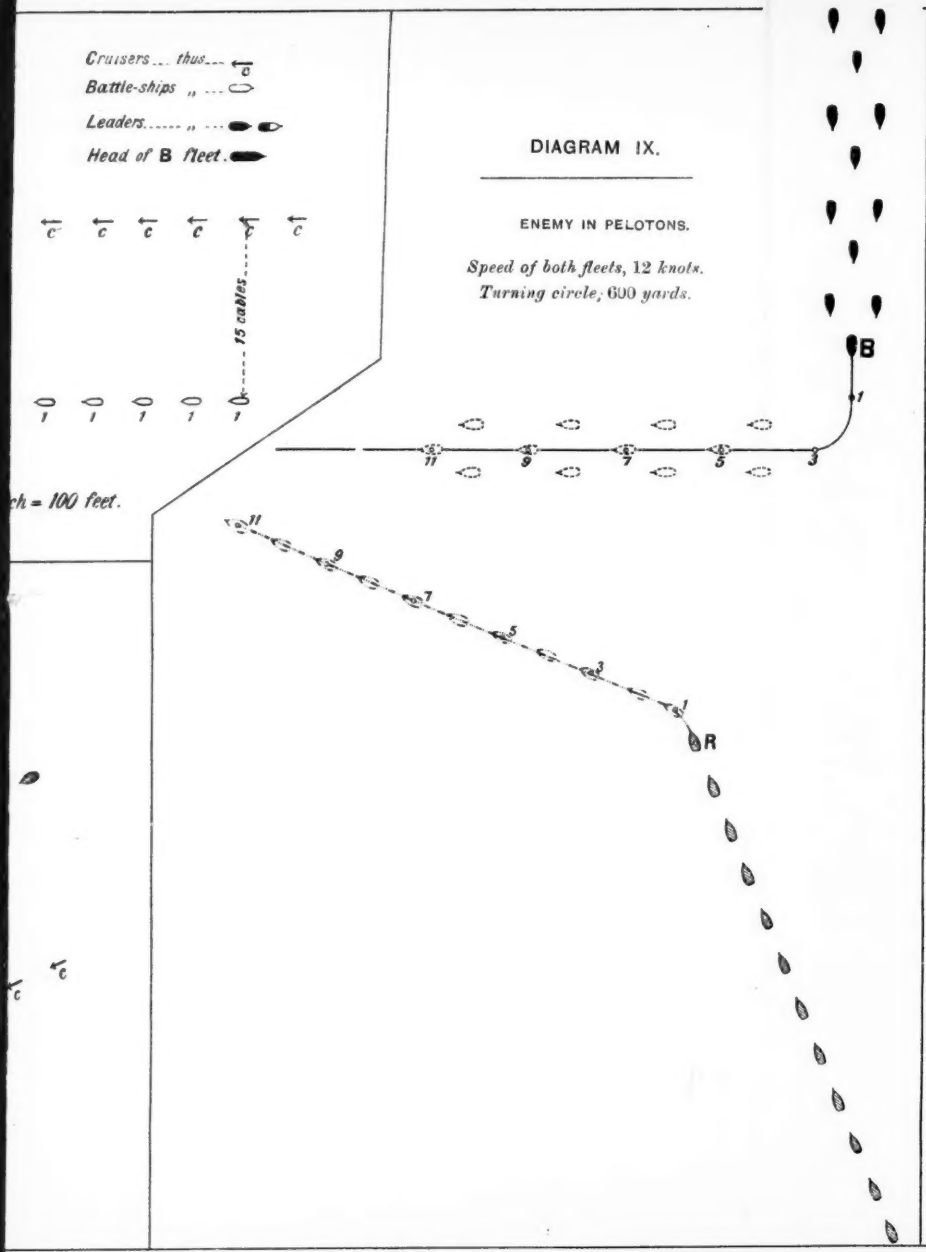
ENEMY IN LINE ABREAST.

Speed of both fleets, 12 knots.
Turning circle, 600 yards.
Torpedo boats, thus ,,,



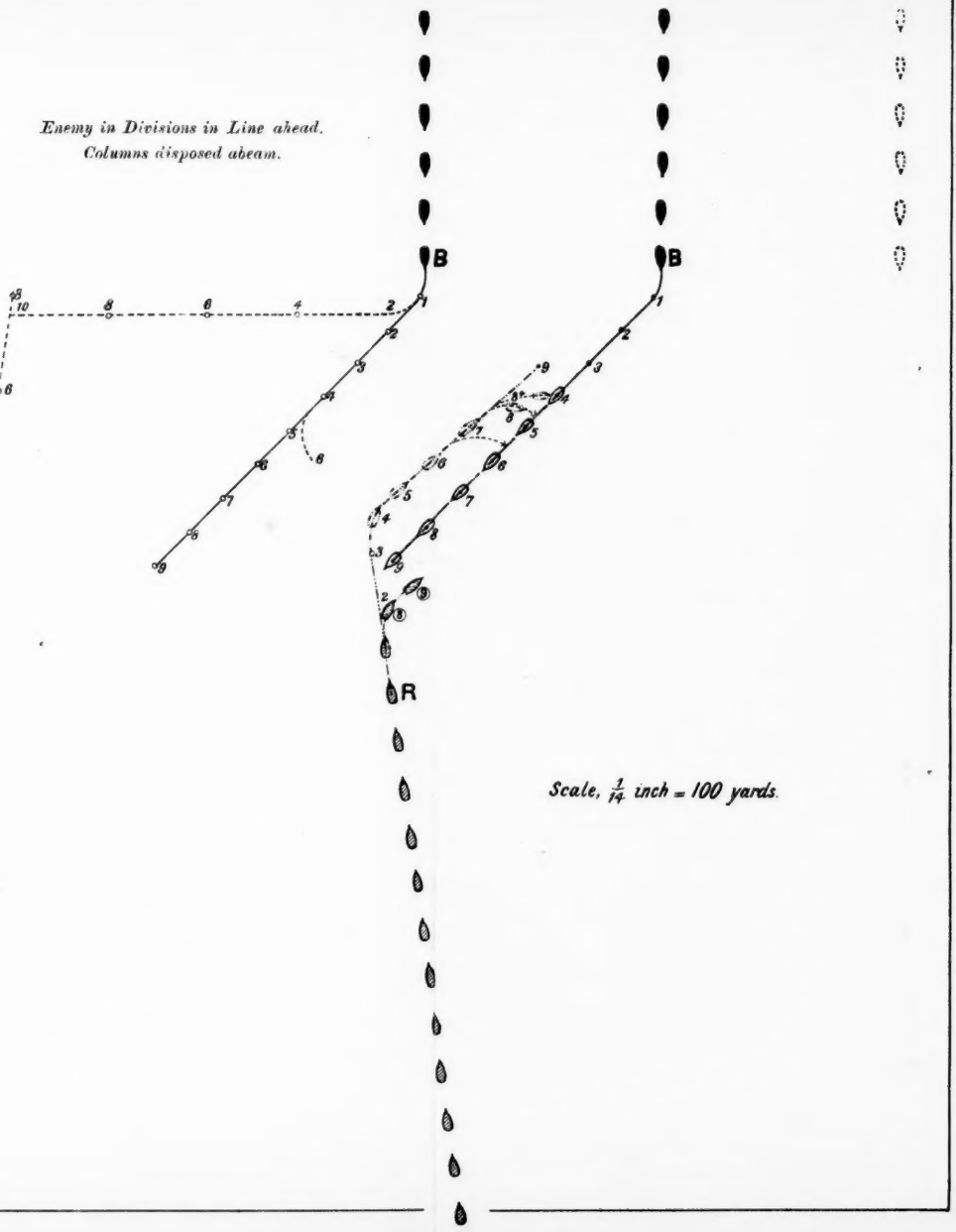
Scale, $\frac{1}{14}$ inch = 100 feet.

Harrison & Sons, Lith., St Martins Lane, W.C.



Harrison & Sons Lith. St Martins Lane W C

Enemy in Divisions in Line ahead.
Columns disposed abeam.



Scale, $\frac{1}{14}$ inch = 100 yards.

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possible the enemy will be in—they can turn. As a rule, a close action at night is to be avoided, on account of the liability of firing into one's friends.

The lines would pass each other, pouring in a heavy fire as they pass. The small, quick-firing guns should be kept in readiness to repel torpedo-boat attacks, which craft, if available, ought to do considerable execution under cover of the darkness, and they will be difficult to repel. If the lines do pass each other, it is important for the blockading one to turn directly they can, so as not to lose touch of the other fleet, and if possible to cut off their rear ships.

The tactics for a night action must of necessity be simple, and the single line ahead accordingly lends itself very well to an action of that kind.

Search-lights.—The use of search-lights calls for special mention. There is no very decided opinion as to how they should be used, and it is quite possible that the ordinary low light will do more harm than good, and therefore should not be used without it has been experimentally found likely to be of use. It has a blinding effect on the men at the guns in the ship using it, and also is very liable to light that ship up, thus facilitating the enemy's aim, except from the ship it has been thrown on.

It is considered, however, that the high light may be used with advantage, if care is taken to keep it off the friendly vessels, and it may help to watch the enemy's movements besides lighting up their vessels to assist the aim of the guns. No doubt its usefulness will be much interfered with by the smoke from the funnels and guns. If used, it will require discretion, and in ships fitted with lights, experience should be gained in peace time as to the best method of using them in a fleet action.

The cruisers might be used in certain cases as torpedo-boats, and a fleet blockading is always liable to this form of attack from any vessel, however large or small, taking advantage of her speed and the darkness to rush past a vessel patrolling, and delivering a torpedo on passing. In fact, at night the torpedo becomes relatively more important, on account of the effective range of the gun being reduced, in consequence of the difficulty of seeing objects at long range, and the increased difficulty of range-finding and judging where the shots are striking, while one hit from a torpedo is all that is required, and, due to its more limited range, the object is more readily seen.

There is no previous experience of night actions to base one's ideas on, and it must remain a rather unknown subject until the first action does take place, although much useful experience may be experimentally gained in our various squadrons on which to base suitable night tactics.

Cruisers.

It is impossible to show diagrammatically the action of the cruisers attached to a fleet.

1. On sighting the enemy, and on closing with his look-out ships;

2. After taking station on the beam of the battle-ships, how they should act.

Battle-ships will proceed surrounded by a line of look-out vessels, the distance of which will depend on the weather, and if it is at night or not.

Besides the above, it is quite possible there will be scouts who may happen to be away when an enemy is sighted; the remainder, when not scouting, and, if not required to complete the look-out ships, will be stationed as a separate squadron, either astern or on the beam of the battle-ships. On sighting an enemy in any direction, without it is intended to avoid him, the look-out ships on that side should close together for mutual support and proceed to reconnoitre, any spare cruisers being sent as connecting links or repeating ships to these vessels. They should give all information as to the probable number of battle-ships, cruisers, the course they are steering, how they bear, &c.

They should avoid engaging the enemy's cruisers, as their principal duty is to report his movements, and an engagement would somewhat distract their attention, but they should not allow themselves to be taken at a disadvantage, and, if the enemy's cruisers made a determined attack on them, they should be reinforced, as possibly he might try and drive them in, with a view to the fleet avoiding an engagement and thus escaping.

There will, no doubt, be many indecisive actions where, probably, only a few of the look-out ships will be engaged, but in these cases no results will be obtained, as these skirmishers will always be able to retire towards the main body if they are getting the worst of the fight.

According to the direction in which the enemy is sighted, and his formation, so the battle-ships will steer and form into their fighting formation. The other cruisers, if the enemy is still approaching, will be recalled and commence to form in their line, and, lastly, when the enemy is distinctly visible from the battle-ships, the remaining cruisers will retire, opening out at once, so as not to mask the fire of their fleet.

As the battle-ships close, the cruisers should open out from them, the direction they should move being guided by the opposing vessels of their class, who they should try and prevent helping their disabled vessels, or trying to capture those of their own fleet. Only part of the cruisers would be required for this duty, the remainder holding themselves in readiness to take advantage of any opportunities that may occur, and might be of use in causing a distraction in case of their own fleet being in difficulties.

The efficient handling of the cruisers might be of great service to the fleet generally. Even during an engagement a look-out ship or two might be of great use in warning the battle-ships of the approach of any fresh vessels, and the cruisers might be able to prevent them joining their fleet without unduly exposing themselves in the attempt.

Groups.

Groups of vessels have been taken last for the reasons which have already been mentioned. The term "group" is somewhat ambiguous, but it has been taken to mean a collection of four or a less number of ships, anything above that number being embraced in the general term of a fleet.

There are several different cases, which may be divided as follows:—

1. Two, three, or four battle-ships or cruisers against the same or a less number of their own class.
2. One or more battle-ships or cruisers against a group of torpedo gunboats.
3. One or more battle-ships or cruisers against a flotilla of torpedo-boats, either with or without the support of a cruiser.
   (*a.*) By day. (*b.*) By night.
4. A fleet against a flotilla of torpedo-boats supported by one or more ships.
   (*a.*) By day. (*b.*) By night.

Torpedo-boat attacks have been included under the head of groups, as no tactical study in these days can be considered complete without it embraces how these craft are to be repelled; but it is not considered to be within the province of this essay how they are to be used for attack. A great deal might be written on the subject.

Generally the same formation can be adopted for groups as for fleets, that is, *line ahead*, but there is not the same necessity for keeping to that formation, as simplicity is not so essential, on account of the ships being so few in number.

Thus, with two ships a slight quarter-line is in some instances preferable, and with three ships a group order might be considered better, and is not open to the same objection as with a fleet.

With four ships probably line ahead is the best all-round formation, except when wanting to develop the right ahead fire; the second and third ships might be stationed slightly on either quarter of the leader.

It is not considered that any particular formation is so essential when a few ships are working in company, but a more important point is that they shall act together and thus prevent the chance of the enemy concentrating his attack on one ship, without that one being efficiently supported by the others; if that is not guarded against, it would be possible for a lesser number of ships to be able to successfully oppose a larger number.

The principle laid down for single ships and fleets should be adhered to for groups; that is, to commence with a gun action, and not to close until there is some advantage, and then to come within torpedo range.

Several writers have discussed the possibility of one ship being able to maintain an action against two. As far as one can judge, the odds appear to be too great, unless the single ship is superior

to either of the others, and, even then, without the superiority is considerable, the single one has not much chance, and I would recommend that that one should make a running fight, in the hope of separating his foes, and then tried to attack them in detail, if he feels his superiority.

This, I think, would apply equally well in the case of a battle-ship *versus* two cruisers, where it is to the advantage of the former to keep them a long time under fire and at a disadvantage, so that they cannot make use of their torpedoes.

Two Ships versus *Three.*—The odds are again very heavy, but there will no doubt be occasions where two well-armed and manœuvred vessels can oppose three with success. The two should manœuvre to try and isolate one of the other three, and at first should approach with that object, but if there does not seem to be an opportunity, they might turn and maintain a running fight in the hope of attaining their object and being able to round on the leading ship. The second ship should form on either quarter of the leader, as necessary, in order to keep a clear line of fire.

Three Ships versus *Four.*—In this case the three ships stand some chance of holding their own with the four. The action should commence with the gun, and the three should only close if they see there is an opportunity of successfully ramming one of the four. Diagrams have not been made for these actions, because they become very similar to those recommended for fleets, and it is considered they would be to a large extent a mere repetition, ramming tactics having been already mentioned.

Torpedo-vessels versus *a Ship or Fleet.*

Two, Three, and Four Torpedo-vessels versus *a Ship or Fleet.*—These may to a certain extent be grouped together, as the same tactics apply to the defence of ships against any type of torpedo-vessel. (2.) Torpedo-catchers will very often act in company, perhaps when patrolling certain channels, and it is quite possible that they will encounter large battle-ships and cruisers belonging to the enemy. Therefore it is important that the means of attack and defence should be briefly touched upon. Of course, in broad daylight they could not effect anything by attacking, but there are many occasions, particularly off the English coast, where fogs and hazy weather are experienced, and these craft might have approached within 2 miles unobserved, or at night they might get within close range before being distinguished, in which case what are the best tactics for the ship?

(*a.*) The ship can turn and keep them under fire for a prolonged time; or (*b*) turn towards them and try to run one or more of them down, while bringing them all under a heavy fire at close range and trying to thwart their taking good aim.

(*b*) always appears a risky plan, as, even supposing several of them are crippled, there is always a chance of one remaining efficient and getting within torpedo range. As regards the hope of running them down. This is a difficult feat, and more so when it

is considered that the turning power of the ship is inferior to that of the smaller vessel.

I believe there is a consensus of opinion that (*a*) should be adopted, as it brings out the weak point of the torpedo-vessel, viz., vulnerability to gun-fire, and also the strong point in the defence of the ship, viz., being able to deliver a heavy fire from a large number of guns.

The ship on sighting these vessels should therefore turn so as to get them bearing on his quarter, and go full speed; by this means they would be kept under fire for a long period from a large number of guns, in the hope of being able to disable them before they are in a position to fire their torpedoes. If they are seen to be gaining, the ship can easily turn a little more away. The torpedo-vessel labours under another disadvantage, as it has to approach within three-quarters of the extreme range of the torpedo before being able to fire.

The above defence applies equally well to a torpedo-boat attack, and should always be adopted.

In the day time it would be fatal for torpedo-vessels to continue an attack if the ship or ships adopted these tactics.

If the torpedo-vessels were supported, it would alter the circumstances of the case, according to the relative power of the ships on each side, but in this case it is even more necessary for the attacked vessels to make a running fight, whatever the strength of the attacking force is.

A flotilla of torpedo-boats may try and surround a ship in order that whichever way the ship turns some boats will be in front and able to attack with advantage.

No ship should allow such a manœuvre, and if the ship is alert, a considerable reserve of speed on the boat's part will be required to effect it, and even with that excess it ought to be impossible.

At night the boats might effect their purpose unobserved by the ship.

Ships at night if in torpedo-boat waters must not show any lights at all, and care should be taken to have all scuttles or ports through which lights can possibly be seen carefully covered over, the use of electric internal lighting above the water-line being restricted as much as possible.

Fog signals should not be used, as they are sure to attract any boats in the vicinity.

The use of flashing signals also should be restricted for the same reason, as they clearly show a man-of-war.

Sighting Boats at Night.—The same tactics should be adopted on sighting boats at night as by day, *i.e.*, to turn at once and increase to full speed, then, if your private signal is not answered at once, open fire. In no case should a boat at night be allowed to approach within 1,000 yds. without he has stopped and made the required private signal, and even then should not be allowed to close further without giving a satisfactory reason. A reliable signalman is very much needed in every torpedo-boat. At night, if there is more than one ship, they should cruise in single line ahead, and on the leader sighting a

boat he should at once turn and make a certain pre-arranged signal to the others to do the same (together) at once, and go on full speed. If this manœuvre is done quickly, assuming the boats to be sighted at a little distance, a considerable fire ought to be brought to bear on them before they are within striking distance. The danger the ships are exposed to is their inability to sight the boats at any great distance except on clear nights.

Fire discipline is of immense importance, particularly against this form of attack. It is necessary for the officers of the quarters to have a clear idea of the position of the other ships. Line ahead is the simplest formation to prevent ships firing into each other, but directly they alter course the danger is increased, and more care is necessary.

Great care is required in preventing indiscriminate firing at the crest of waves, &c., as, besides the disorganization it causes, the waste of ammunition will be enormous. No firing should be permitted until the particular quarters are ordered by bugle or siren to commence, and then the officer of the quarters should use his discretion to stop the fire if the object becomes invisible by smoke, &c.

The barbette or turret guns should not be used, but the large quick-firing guns with smokeless powder will be very effective.

The smaller quick-firing guns are the principal weapons, rifle fire being reserved and fired in volleys if the boats approach within 1,000 yds., but if it interferes with the guns it is probably better not used, as at the most it is only effective against the crew.

If an attack is delivered from two directions at once, which way the ships should turn will depend largely on what bearings the boats approach, the ships trying to turn in any direction the boats are not approaching in. If they are approaching on either bow, without they are sighted in good time, the leader, at all events, would not have time to turn; the others might turn together. The leader's best chance appears to be to head for one division of boats and go on full speed in the hopes of sinking them with her guns and ram.

Use of Search-light.—Search-lights from ships under weigh should on no account be used until a boat is discovered, and then for preference the one in the top should be at once thrown on the boat, in order to help the aim of the guns. The use of any light which blinds the gunners should be avoided. The beam must be kept off friendly vessels, as it helps the attack. But if a beam can be kept on each boat it will interfere with them considerably, and is likely to cause torpedoes being fired out of range and the boats to aim at the light instead of at the centre of the ship, and thus reduce the chance of their striking.

4. *Fleet* versus *one or two vessels supporting a flotilla of boats*, either by day or night. This condition is very likely to occur in war, and is practised in most of the foreign naval manœuvres, viz., using the mobile defence (a large number of torpedo-boats supported by one or more ships) to attack a fleet, and thus prevent them effecting some destruction on their coast or establishing a blockade. If the fleet appeared off an important port, it is quite possible that two dozen or more boats might be sent out against it.

By Day.—The loss of boats might be severe if it was pressed home; still, if the fleet continued to advance, they might quite possibly lose one or two ships, as it will in the best of weather be next to impossible to sink each one of a large number of attacking boats advancing at high speed, by means of gun-fire only.

Being daytime it will be perfectly simple for the fleet and their look-outs to turn away and keep the flotilla under fire for a long period, which undoubtedly should be done, and speed increased if considered necessary. Now would be the time for the anti-torpedo-boat vessels, and they should be sent to sink the advancing boats. They will be exposed to the fire of the supporting vessels, so will probably not be able to advance as far as they might wish. As they advance they must open fire on the approaching boats, and should form into a broad front formation, so as to bring a good fire to bear; but the best way for catchers to prevent boats getting past and attacking the ships is up to the present an unsolved problem. It is doubtful whether the gun-fire from the catchers, which have such lively platforms, will be as effective as is desired, and as the time is very limited to disable such a number of boats, ramming tactics will have to be adopted besides; they should do as much execution as possible with their guns while approaching, and then try to run the boats down; experience only will be able to fully determine the best way to do this, but, assuming the catchers to be in a loose line abreast, as they will be picking up station while they are advancing to meet the boats, not being formed will not matter in this case, as the boat's main object is to avoid them and attack the battle-ships. However, in self-defence they may fire a torpedo or two at the catchers. If the boats advance in line abreast each catcher will more or less be able to single out a boat; if there are more boats than catchers there is a possibility of these getting past, as it is doubtful if a single catcher could sink more than one boat.

In this case it would appear to be the best policy for the catcher to keep the torpedo-boat as near as possible right ahead, and, for each alteration of course in the boat, the catcher should also alter to preserve this position, remembering always to try and keep between the fleet and the attacking boat; if this can be done, the only chance the boat has of getting past is by using its superior turning power at the last and passing close to the catcher. This the boat might be able to do, and perhaps give the catcher a torpedo in passing, but the latter will be able to fire down on his decks, and, with his larger crew, ought to be able to decimate the torpedo-boat's crew, in addition to the damage he may have done before coming to close quarters.

If the boats advance in line ahead the catchers' task will be much more difficult, as they will be only able to prevent the majority of boats getting past by their gun-fire, it being a moral impossibility to run many down in that formation, particularly as they keep such close station. Still at all hazards the nearest catchers must run at the leading boats, their next astern will ram the catcher, as probably even if they wished to they could not avoid it. What damage is done will depend on the types of vessels concerned. The catchers on each

wing must turn inwards and try and cut off the next boats, but it will require good handling to prevent some of the boats getting through.

The boats in line ahead are more vulnerable to the gun-fire of the fleet than in line abreast, but otherwise it is a stronger formation and is more likely to be adopted.

If the catchers are formed up in rear of the battle-ships to commence with, they had better advance in line ahead to meet the boats (if they are in the same formation), and the catchers can then turn together and charge through the boats. If they are not formed, there would not be time to adopt this formation.

An attempt has been made to treat the subject under consideration in as practical a manner as is compatible with a written essay, which, although falling far short of what it might be, it is hoped has not been altogether a failure.

I should like to lay stress on the increasing importance of tactical training for all executive officers in view of the great activity which is being displayed by all maritime nations in their navies, not only in increasing the number and strength of their ships, but also in the improved training of their officers and men. It therefore behoves us not to neglect any opportunity of improving our system of tactical training for war, and if the conclusions arrived at by the experience of our leading tacticians could be more widely disseminated through the fleet, I venture to think the result would be of great benefit to the majority of officers, and of immense value in case of hostilities. I will conclude with the words of the motto chosen for this essay, "In war it is not permitted to err twice."

TABLE A.—*Different Ramming Attacks in War.*

Date and place of attack.	Description of attack.	Result.
American Civil War, 8/3/1862	1. Confederate monitor "Merrimac" rammed wooden frigate "Cumberland" at anchor	Successful, at anchor.
9/3/62, "Merrimac" *versus* "Monitor"	2. Monitor tried to ram "Merrimac".....	Failed.
	3. "Merrimac" afterwards tried to ram wooden frigate "Minnesota," but monitor saw it, and put her helm over and took it on the quarter. No serious damage	
18/4/64.....	4. Confederate ram "Albemarle" rammed "Southfield" when lashed alongside another double-ender	Successful.
	5. "Albemarle" *versus* three double-enders. One put her helm over and rammed "Albemarle" on starboard quarter with no result	Would have been partly successful with more equally built vessels.
	6. "Manasses" rammed "Richmond" at anchor	Partly successful, at anchor.

TABLE A—*continued.*

Date and place of attack.	Description of attack.	Result.
Galveston.....	7. "Harriet Lane" *versus* "Bayou City" and "Neptune"—	
	H. L. rammed B. C. No damage	River steamers. Result nil.
	N. rammed H. L. N. much damaged..	
	B. C. then rammed H. L. No damage, but B. C. took her by boarding	Three collisions.
Mississippi..	8. Confederate ram "General Bragg" rammed gunboat "Cincinnatti" on starboard quarter	No result.
	Confederate rams "General Price" and "General Sumter" tried to ram the same gunboat	One succeeded.
	9. "General Van Dorn" rammed "Mound City;" the latter sheered and made it a glancing blow	Partly successful.
	Note.—In this engagement eight Confederate rams attacked the "Cincinnatti," which was unsupported for half an hour.	
Off Memphis ..	Two Federal rams and five gunboats *versus* eight Confederate rams.	
	10. Federal ram "Queen of the West" rammed "General Lovell." Immediately afterwards	Successful.
	11. Confederate ram "Beauregard" rammed "Queen of the West"	"
	12. Confederate rams "Beauregard" and "General Price" tried to ram Federal ram "Monarch," but rammed *each other* The "General Price" had to be run ashore, and the attacked ship "Monarch" rammed and sunk the "Beauregard."	Failed, and attacking ships both disabled.
24/4/1862. Passage of Union Fleet past Fort Jackson	13. Confederate ram "Manasses" tried to ram "Pensacola," which ship avoided it by use of helm	Failed.
	14. "Manasses" rammed "Mississippi"; only a glancing blow, not much damage	Partly successful.
	15. "Manasses" rammed "Brooklyn." The M. was hid under the bank, and was not seen. B.'s side stove in, but chain armour proved a great protection	"
	16. Confederate rams "General Moore" and "Stonewall Jackson" rammed the corvette "Varuna"	Successful.
	17. Federal corvette "Oneida" rammed a Confederate ram which she was chasing	"
Vicksburg	18. Federal ironclad "Essex" tried to ram the Confederate ram "Arkansas." Only rubbed sides	Failed.
	19. Federal ram "Queen of the West" rammed the "Vicksburg" when made fast to a wharf, and did considerable damage	Successful; other ship alongside a wharf.

TABLE A—*continued.*

Date and place of attack.	Description of attack.	Result.
Vicksburg *cont.*	20. The (captured) Confederate ram "Queen of the West" and Confederate ram "Webb" *versus* "Indianola"—	
	(*a.*) Q. of W. rammed barge alongside "Indianola" and sank ditto	Failed.
	(*b.*) Q. of W. and "Indianola" met end-on with such a blow that most of the men were knocked down	Failed; met end-on.
	(*c.*) Q. of W. rammed and sank a barge on the other side of "Indianola"	Failed.
	(*d.*) Q. of W. tried to ram "Indianola," but only a glancing blow	"
	(*e.*) Q. of W. rammed "Indianola," and sank her	Successful.
Attack of Mobile, Aug. 5, 1864	21. Confederate ram "Tennessee" tried to ram Federal flagship "Hartford," which ship easily avoided the blow	Failed.
	22. "Tennessee" tried to ram "Monongahela"; the latter ship avoided it, and struck the ram a glancing blow on the quarter	"
	23. "Tennessee" again turned to attack the Federal fleet, and an engagement ensued between her and the Federal monitors "Monongahela," "Lackawanne," and "Ossipee" The M. rammed the "Tennessee" amidships; the L. rammed her amidships the other side. "Tennessee," being so strong, was not damaged.	Partly successful, or at least would have probably been with more equally strong ships. "Three to one."
	24. "Hartford" tried to ram "Tennessee"; rubbed sides only	Failed.
	25. "Hartford" again tried to ram "Tennessee," but her consort, the "Lackawanne" rammed her instead	"
	26. *Five* of the Federal ships engaged the "Tennessee" and tried to ram her again, but could not do it, although her rudder chains were shot away. Their gun-fire eventually caused her to surrender	"
Austro-Italian War. Lissa, 1866	1. Italian flagship made *two* attempts to ram the "Kaiser"	Failed.
	2. Italian "Portogallo" tried to ram the "Kaiser," but was rammed by the "Kaiser" instead	Failed, and attacking ship rammed.
	3. Austrian flagship "Ferdinand Max" rammed the "Rè d'Italia" *Note.*—"Rè d'Italia" surrounded by Austrians, and had her rudder damaged, and was unmanageable.	Successful.
	4. Italian "Ancona" tried to ram "Ferdinand Max"	Failed.

TABLE A—*continued.*

Date and place of attack.	Description of attack.	Result.
Austro-Italian War. Lissa, 1866, *cont.*	5. Italian "Portogallo" tried to ram an Austrian frigate	Failed.
	6. Italian "Maria Pia" tried to ram an Austrian ironclad	„
	7. Italian "Affondatore" tried *three* times to ram the "Kaiser" when the latter ship was disabled	„
Chilian-Peruvian War, 21/5/1879	1. Peruvian ram "Independencia" tried *three* times to ram the old gunboat "Covadonga"	Failed, and finally ran on shore.
	2. Peruvian ironclad "Huascar" tried *three* times to ram "Esmeralda"	Failed.
8/10/79	3. Chilian ironclad "Cochrane" tried to ram "Huascar," although "Huascar's" steering gear was disabled	„
	4. Chilian ironclad "Blanco Encalada" tried to ram "Huascar"	„

TABLE A.—*Synopsis of Results of Successful Ramming Attacks.*

Occasions at anchor.	Occasions under way.	Partly successful.	Successful.
One at anchor .	.....	..	One at anchor.
„	.....	One at anchor.	
One alongside a wharf	.....	..	One at anchor.
	One	..	One.
	One	One.	
	One, but immediately afterwards was rammed by another vessel.	..	One.
	One.	One.	
	Two ships against *one*. The single one was rammed.	..	One.
	One.	..	One.
	Two against one. The one was rammed.	..	One.
	Three against one. Single one was rammed.	..	One.
	One.	..	One.
	One.	One.	
Total. Three at anchor	*Six*, single-ship encounters. *Three*, when outnumbered. *One*, attacking ship rammed immediately afterwards.	*Four.*	*Nine.*

This makes 13 out of 37 ramming encounters, although in several of these cases several attempts were made; or a percentage of 35 per cent. of successful attacks. If single-ship encounters under way are considered, there was only a percentage of 20 per cent. of successful attacks.

TABLE B.—*Single-Ship Actions.*

Principal weapon.	Authority.	Where stated.	Remarks.
Ram	Sir Edmund Fremantle	Prize Essay, 1880	Summed up generally in favour of ramming tactics.
,,	Sir George Elliot	Lecture in 1884 at Institution	"The Ram, the prominent feature of Future Naval Victories."
,,	Admiral Colomb	In 1871, lecture at Institution	"The Ram superior to Guns."
,,	Commander Bainbridge Hoff, U.S.N.	1885. "Modern Naval Tactics"	"The Ram, the most formidable of all the weapons of a ship."
Gun	Admiral Long	Lecture at Institution in 1892	
,,	Captain Noel	Discussion on Sir George Elliot's lecture in 1884	"Gun principal weapon at first, but towards the close, the use of your ram comes in."
Torpedo	Lieutenant Sturdee ..	Prize Essay, 1886	Principal weapon if ships close; the torpedo has ousted the ram out of its first place.

TABLE C.—*Fleet Actions.*

Principal weapon.	Authority.	Where stated.	Remarks.
Ram	Sir Edmund Fremantle	Prize Essay, 1880	Attaches considerable value to the ram.
,,	Admiral Bourgois (Fr.)		
,,	Admiral Jurien de la Gravière (Fr.)		
,,	Admiral Touchard (Fr.)		
,,	Admiral Count de Gueydon (Fr.)		
,,	Sir George Elliot		
,,	Commander Bainbridge Hoff (U.S.N.)	"Modern Naval Tactics" (1885)	
,,	Author of "Battle of Port Said"	1884	"Ram is the most powerful weapon."
,,	Captain Noel	Discussion on Sir George Elliot's lecture in 1884	Ram is the arm of first importance in a general action.
,,	Captain Werner (German)	In 1873.....	All formations should be made in view of the ram being the most formidable weapon.

TABLE C—*continued.*

Principal weapon.	Authority.	Where stated.	Remarks.
Gun	Sir Edmund Fremantle	In 1886. Lecture at Institution	Action commenced by skilful manœuvring, the gun being the chief weapon. Ram used in self-defence, torpedoes as opportunity offers.
,,	Lieutenant Wainwright (U.S.N.)	Lecture at U. S. Institute in 1890	First use the gun until a portion of the enemy's fleet has been disabled, then the ram. Torpedoes have been over-rated.
,,	Admiral Colomb	..	Gun superior to ram in fleet action.
,,	Admiral Long.....	Lecture at Institute of Naval Architects, 1892	"First phase, an artillery duel, then close and use the ram and torpedo."
Gun and ram	Sir William Dowell..	Lecture at Institution in 1881.	Gun and ram on an equality, because of the range of former, and that it can be trained. Torpedo only considered as an auxiliary.
Torpedo and gun	Lieutenant Sturdee..	Prize Essay, 1886	Fleet should try and pass outside torpedo range, and attack enemy with torpedo-boats. Gun, therefore, becomes the first ship weapon.

TABLE D.—*Opinions on the Different Formations.*

Formation for attack.	Authority.	Where stated.	Remarks.
Line ahead..	Admiral Colomb.....	In 1871	Prefers line ahead. Columns disposed abeam as an attacking formation.
,,	Admiral Penhoat (Fr.)	..	Good formation if plan of action is based on gun-fire, but if on the use of ram, then line abreast is preferable.
,,	Lieutenant Besson (Fr.)	..	Likes it because of its flexibility.
,,	Captain Grillo (Ita.)	In 1881	Prefers it, but reinforces the head and rear of the line by a ram on each quarter of the leading and rear ships.

TABLE D—*continued.*

Formation for attack.	Authority.	Where stated.	Remarks.
Line abreast	Admiral Randolph...	Lectures at Institution	Prefers either this or line of bearing to any other formation.
,,	Admiral Bourgois (Fr.)	"Revue Maritime et Coloniale," 1876	Recommended it 1 cable between each ship for attack by rams.
,,	Admiral Count de Gueydon (Fr.) Admiral Penhoat (Fr.)	..	Recommended this formation for attack.
,,	Lieutenant de Penfenteyo	..	Single line abreast for first charge, then reverse their course, turning same way, and form groups.
Groups	Captain Noel.....	Prize Essay—"Gun, Ram, and Torpedo"	Enemy in line ahead, attack in groups in line ahead; if in line abreast, attack in groups in line abreast.
,, ...	Captain Campbell....	Essay on same subject	
,, ...	Sir Edmund Fremantle	Prize Essay, 1880	Recommends a special form of groups.
,, ...	Sir William Dowell..	Lecture in 1881 at Institution	Recommends groups arranged according to formation of enemy.
,, ...	Sir George Elliot....	Do. in 1884.....	Best formation. Leaders in line abreast.
,, ...	Lieutenant Sturdee..	Prize Essay, 1886	
,, ...	Admiral Bouet Willaumez (Fr.)	..	Peloton form of groups.
,, ...	Captain Leaval (Fr.)		
,, ...	Captain Werner (German)	In 1873	Right-angled triangular group.
,, ...	Lieutenant Cattori (Ita.)	..	Equilateral triangular group.
,, ...	Commandant Z. and H. Montéchant	"Les Guerres Navales de Demain." 1891.	Recommend a special group of six ships.
Bow and quarter line	Admiral Tegethoff...	Battle of Lissa ..	Attacked Italian fleet in double quarter line, the latter in line ahead.
,,	Lieutenant Wainwright, U.S.N.	In 1890	Recommends it.
Indented line	Comte de Gueydon (Fr.) Admiral Bouet Willaumez (Fr.) Admiral Penhoat (Fr.)	..	Considered indented line ahead or abreast an excellent fighting formation; while Sir Geoffrey Hornby thinks it dangerous as a fighting formation, on account of the columns being within their manœuvring distance.

OCCASIONAL PAPERS.

MANŒUVRES IN IRELAND, 1893.

In this paper it is proposed to give some account of the field manœuvres carried out last year in Ireland by the troops in the Curragh and Dublin districts.

They were on a small scale, but none the less were valuable, as forming (as all manœuvres should) the culminating stage of the annual course of the soldier. Is it too much to hope that the time is not far distant when there may be some kind of manœuvres annually in every command?

At present there seems to be an impression that the Aldershot Manœuvres in Berkshire were the only ones carried out last year, and it is to correct this idea that these papers are now published.

The ground naturally is the first difficulty; in Germany, troops may manœuvre anywhere over private property; here in the United Kingdom leave is often impossible to obtain. At the first series of the manœuvres of which this short narrative is given, the tenants in Queen's County evinced far more good will than those of Kildare. Still, in Ireland ground is more easily obtainable than in England, and next season operations will probably take place over quite new ground in Queen's County, giving the troops practice in working through woods, and over a hilly tract of country.

Without manœuvres it is impossible to test the value of the instruction and training the soldier and his officer have gone through, and what their individual intelligence and practical efficiency really amount to. Are they self-reliant, will they exercise their common sense, or has it been all theory?

Then, the manœuvres recurring annually, should be *progressive* in their instruction, something fresh practised every day, so that at the close all may feel they have learnt many things.

These are all truisms no doubt, but it is important to show how valuable such experience is to all arms, and how every effort should be made to give as many of our troops as possible an opportunity of taking part in peace manœuvres.

There were two short series of manœuvres in Ireland: the first series between a cavalry brigade and a mixed brigade, the operations taking place from 14th to 18th August, in Queen's County and co. Kildare, principally along the line of the River Barrow, and thence to Maryborough Heath.

The area of operations (refer to map):—

On the North—Newbridge, Rossmore Lodge, Monasterevin, Emo (village).
On the West—Emo, R.C. Chapel at the south-east corner of Great Heath of Maryborough.
On the South—R.C. Chapel (Great Heath of Maryborough), quarter of a mile south of Vicarstown Bridge, Eagle Hill House, Old Kilcullen.
On the East—Old Kilcullen, Newbridge.

As will be seen, this area embraces a tract of country in Kildare and Queen's County, about 20 miles in length, and, on an average, 6 miles in breadth.

The country in this zone consists of enclosed grass or cultivated fields, with numerous patches of bog and marsh, rendering the movements of troops off the roads, with some exceptions, impossible. Permission was, however, obtained in a few cases for artillery to take up positions in the fields, and advantage was taken of this, notably at Nutgrove, Lugg Hill, and Riverstown.

The roads between Curragh and Maryborough traverse two main obstacles:—

Firstly. The River Barrow, passable by bridges at Monasterevin and Dunrally, and by a ford at Riverstown (during the manœuvres, a pontoon bridge was constructed at the latter place).

Secondly. The Grand Canal, passable by bridges at Monasterevin, Fisherstown, Courtwood, and Vicarstown.

Lateral roads are frequent, and were fully used, to keep up communications between the several columns; as owing to the flat and enclosed and wooded country, communication, except by cyclists and mounted orderlies, was difficult.

Weather.—The weather was fine throughout, and generally the heat during the marching hours was great; but, though the infantry in marching order were at times somewhat exhausted by the sun, dust, and stillness of air, they did not really suffer ill effects.

Considering the hard work performed by the mounted troops previous to and during the operations, the casualties amongst the horses were very few and their condition satisfactory.

Health.—The health of the troops was good, but, as is so constantly the case, some of the men suffered from blistered feet; and it may be hoped that the recent paper on "The Soldier's Sore Foot," read at the Royal United Service Institution by Surgeon-Captain Beevor, of the Scots Guards, may lead to some improvement in this respect, as the soldier who cannot march is only an incumbrance.

Water.—It is suggested that each water cart should have a small pump and hose attached as part of its equipment. This would economise time and labour, both in filling the carts and distributing the water.

Cooking.—An experimental cooking apparatus designed by the Quartermaster of the 2nd Batt. Worcestershire Regiment was taken with the mixed brigade, the brigadier having been instructed to allot it to one of his battalions for trial. The report on it was very favourable.

Signalling.—The weather was so abnormally favourable that the heliograph by day, and the limelight by night, were generally used. Still, to ensure uninterrupted communication, intermediate stations within flagging distance were organized. A total of 6 non-commissioned officers and 24 men were employed at the signal stations, with 6 cyclists and orderlies.

Cycling.—The brigadier, mixed brigade, speaks in the highest terms of the services performed by his cyclists. Drawn at short notice from different units, using machines their own property, and placed under the orders of an officer known to few of them, the zeal and energy they displayed throughout the manœuvres reflects great credit upon the men and their commander.

It was observed that they were employed generally as a tactical body; but, looking to the enclosed nature of the country, it is considered that they might have obtained lateral communication between the columns on the march and with the brigadier, when signallers were unable to do so and the cavalry were employed elsewhere.

Cyclists were of great use in conveying messages from terminal signal stations. There can be no question that they would be of real value on service; and it is strongly recommended that a cyclist section, properly equipped, may be sanctioned for each battalion.

Sound Signals, for use by Artillery.—

When firing at cavalry, 1 gun.
" " artillery, 2 guns in quick succession.
" " infantry, } 3 guns in quick succession.
" " dismounted cavalry, }

These were used with marked success during the manœuvres, and at the conclusion of the drill season were favourably reported on.

First Series—Curragh Field Manœuvres.

General Idea.—A cavalry brigade with horse artilllery attached, based on Limerick, opposes a mixed brigade encamped on the Curragh of Kildare.

Strength.—

(*a*) Cavalry brigade. Lieut-Colonel A——.
2 regiments cavalry with machine guns.[1]
2 batteries horse artillery.
R.E.

(*b*) Mixed brigade (hereinafter described as the "Curragh Column"). Lieut.-Colonel X——.
4 battalions infantry with machine guns.[2]
1 regiment cavalry.[3]
2 batteries field artillery.
R.E.

[1] Designated C and D in Narrative.
[2] " F, G, H, and K in Narrative.
[3] " E in Narrative.

Operations.

First Day.—Monday, 14th August, 1893.

Cavalry brigade move to Maryborough Heath and encamp there, detaching a squadron to Rath House (contact squadron). One squadron Curragh column moves to Duneany (contact squadron).

Tuesday, 15th August, 1893.

General Idea.

The reconnoitring troops of one of the columns of an invading force, based on Limerick, have reached Maryborough. A hostile force is encamped near the River Liffey.

Special Idea (Cavalry Brigade).

From General Officer Commanding, Roscrea.
To Lieut.-Colonel A—— Commanding Cavalry Brigade, Maryborough.

Roscrea,
6 P.M., *14th August*, 1893.

1. The enemy has fallen back before our southern column, and is held to a position on the Galtee Mountains.
2. Local reports affirm that hostile infantry only have as yet crossed to the left bank of the Liffey.
3. Push forward to-morrow morning a reconnaissance towards Kilcullen and Newbridge, and despatch an officer's patrol to endeavour to destroy the G.S. & W. Railway at some point east of Kildare.
4. I shall not leave this until you can report progress.

Brigadier's Orders, 14th August, 1893.

Dispositions of Regiments.—C Regiment to reconnoitre towards Newbridge, crossing the Barrow at Monasterevin Bridge, which is to be strongly held. If possible a patrol will be pushed down the Kildangan-Kildare Road, which will be the southern limit for reconnoitring for this regiment: 1 squadron at Ballybrittas and Jamestown; 2 squadrons at Monasterevin; 1 squadron (the contact squadron) to cross the river at Riverstown.

D regiment to reconnoitre towards Kilcullen, crossing the Barrow by Dunrally Bridge, which must be held. Patrols will push down the Nurney-Kildare and Kildoon-Kildare Roads; 2 squadrons at wooden railway bridge, L. 12; 2 squadrons to reconnoitre to front through Nurney and Kildoon towards Kilcullen, and establish communication with No. 1 Regiment at Crosskeys and Kildangan Cross Roads, M. 10. Northern limit for reconnoitring for this regiment up to the Crosskeys-Kildangan-Kildare road, but not the road.

Communication between the 2 regiments must be established at Crosskeys, L. 10, and Kildangan Cross Roads, M. 10. And the line Monasterevin, Kildangan Cross Roads, M. 10; Nurney, O. 11, Kildoon, P. 11, must be occupied by 7 A.M. if possible.

C Regiment will endeavour to get an officer's patrol through to destroy the railway east of Kildare.

When forced back from the river the line of the canal will be held. Further retirements will be by the same roads as the advance unless any concentration is ordered.

Bridges must not be destroyed. The R.H.A. will advance viâ Ballybrittas to Fisherstown, and oppose any attempt of the enemy to cross the river there.

The brigadier will be at Fisherstown; all information to be sent there.

SPECIAL IDEA (Curragh Column).

At 4 P.M., on 14th August, the situation is thus:—

A contact squadron at Duneany, patrolling the River Barrow from Monasterevin to Dunrally Bridge, the remainder of the force in quarters at Newbridge and the Curragh.

The following despatch is handed to the brigadier commanding, from the Headquarters, in Dublin:—

DUBLIN,
1 P.M., *14th August*, 1893.

1. Enemy's cavalry patrols have been seen on the Great Heath of Maryborough.

2. I wish you to take the field, and drive west any hostile troops you may meet. It is of the utmost importance that the railway at Maryborough Junction should be in our hands, as I am anxious to despatch on the 18th inst. reinforcements to the south by the Waterford and Kilkenny Branch.

3. Direct your cavalry to secure the passages of the river to-morrow, and to endeavour to reconnoitre the country to the west as far as the line Ballybrittas—Cromwell's Lines. Advance with the remainder of your force to Crosskeys; and at daybreak on the 16th inst., construct a pontoon bridge at any convenient point near the old ford at Riverstown.

4. Keep me informed frequently by telegraph of all that occurs.

Brigadier's Orders, 14th August, 1893.

E Regiment. Leave Newbridge 6 A.M., detaching 2 squadrons to Monasterevin, 1 squadron to Riverstown Ford. Contact squadron leave Duneany 6 A.M. to seize Vicarstown Bridge, if possible. Cyclist corps will reinforce this squadron as soon as possible.

F battalion and field battery R.A. Rendezvous at 5.30 A.M., proceeding by Kildare—Monton House to Railway Bridge, L. 9. Head of column on bridge at 9 A.M.

R.E., field battery R.A., K and H battalions. Rendezvous, French Furze Green, at 6.15 A.M., proceed by Tally House—Duneany Wood. Head of column to be at Cross Roads, ¼ mile S.W. of wood, at 9 A.M.

G battalion, with baggage of column packed, at Brownstown Constabulary Barracks 6 A.M. Half battalion escort to baggage proceeding by Suncroft, Eagle Hill, Kildoon to Cross Roads, S.W. Duneany Wood. Head of column to be there at 9 A.M.

Cyclists will rendezvous at French Furze at 6 A.M.

The brigadier will be with advanced guard of K battalion, and will receive all messages from cavalry at Cross Roads, ¼ mile S.W. Duneany Wood; at that point he will make further dispositions of his force as may be required.

Ambulances. 4 men per regiment, detailed as bearers, will join the ambulances in their respective lines on parade.

Water carts. 1 N.C.O. and 1 man, in addition to men detailed to lead the horse, will accompany water carts. On arrival in camp, water carts will form up at supply store.

Camps. On arrival in camp, infantry will be formed in close column.

NARRATIVE.

Events in the North.

Cavalry Brigade.—About 7 A.M. 2 squadrons C Regiment at Monasterevin. Patrols in possession railway bridge, Carlow Junction, M. 7. Officer's patrol despatched to cut railway E. of Kildare. Junction effected with contact squadron Crosskeys.

Curragh Column.—7 to 9 A.M. 2 squadrons push through Kildare towards Carlow Junction. Advanced guard F battalion arrive about same time; both acting together press back enemy's cavalry into

Monasterevin. The latter, holding every possible position, and reinforced by a squadron at Cross Roads, J. 8, opposite Moore Abbey Gate, drive back the Curragh Cavalry, and hold the position till arrival of Curragh infantry; then, holding the village too long, they suffer somewhat severely as they retire.

9 to 10.15 A.M. F battalion holds the village of Monasterevin, Enemy's cavalry retiring along the parallel road towards Maryborough, Curragh cavalry following, and when hostilities ceased for the day, 2 squadrons cavalry brigade, with 4 guns R.H.A., are holding Cross Roads G. 9. At Kildare, a subaltern with an officer's patrol, cavalry brigade, evading Curragh cavalry at Kildare, succeeded in destroying the railway E. of that town at 9.30 A.M.

Events in the Centre.

Cavalry Brigade.—At 6.5 A.M. The contact squadron, cavalry brigade, crossing the the ford at Riverstown unopposed, and leaving 2 machine-guns and 1 troop to hold it, proceed to Crosskeys, which they occupy; being reinforced by a troop from Monasterevin at 6.30 A.M. About 7 A.M. they are attacked by a troop of Curragh cavalry and 10 cyclists, and repel the attack.

7.50 A.M. At this time 2 troops Curragh cavalry and 10 cyclists, holding Cross Roads near R.C. Chapel, Kildangan, repel an attack by 1 troop of cavalry brigade from Cherry Mills.

8.25 A.M. Situation remained unchanged until arrival of the squadron from Curragh, who attack the position at Crosskeys. Enemy's cavalry retire, and reunite across the Barrow at Riverstown, lining the hedges, about 80 yds. from, opposite and parallel to, the river where the 2 machine-guns were in position, leaving a patrol to watch the ford.

9.20 A.M. About this time a patrol of Curragh cavalry, seeing the ford was held, sent back word, and a company of K battalion arrive, and, lining the banks on left bank of river, open fire. Each party hold their own, but a troop of cavalry brigade crossing the ford later suffer severely.

10.50 A.M. Two companies of K battalion reinforce, bringing a machine-gun; but, as neither party makes any forward movement, each holds its own bank of the river when hostilities cease for the day.

Curragh Column.—F battalion (except 2 companies at Monasterevin), and the field artillery march unmolested to their respective camps at Crosskeys and Riverstown, the latter taking up a position commanding the ford.

Events in the South.

Cavalry Brigade.—7 to 9 A.M. D Regiment having crossed Dunrally Bridge and prepared it for demolition, move on as ordered, and, crossing railway bridge K. 12, move forward, with 2 squadrons, towards Cherry Mills. Communication established with C Regiment on their left (north).

9.30 to 11.20 A.M. Some skirmishing takes place in this neighbourhood, and D Regiment finally retire over Dunrally Bridge, leaving 1 squadron at the bridge (temporarily impassable) and 3 squadrons in the neighbourhood of Vicarstown and Courtwood bridges, where they remained till conclusion of hostilities for the day.

Curragh Column.—3 companies of infantry, supporting cavalry, reached Dunrally Bridge at 10.40, driving enemy's cavalry before them.

The remainder of the brigade, not being required, marched to their camps.

When hostilities ceased for the day, the position of the troops was as follows:—

	Cavalry Brigade.	Curragh Column.
North—		
Monasterevin Cross Roads.	2 squadrons.	2 squadrons.
G. 9.	1 batt. R.H.A.	2 companies of infantry.
Ballybrittas.	1 squadron.	
Riverstown.	1 squadron, 2 machine-guns.	1 batt. R.A., 3 companies of infantry, 1 machine-gun.
Centre—		
Lugg Hill.	..	1 batt. R.A., 1 company of infantry.
Crosskeys.	..	2 battalions, 7 companies of infantry.
South—		
Dunrally.	1 squadron.	3 companies of infantry, 1 machine-gun.
Vicarstown. Courtwood.	3 squadrons.	10 cyclists, 1 section R.E.
Neighbourhood.	1 batt. R.H.A.	

The bridges at Monasterevin and Dunrally were held by the Curragh column at the close of the day's manœuvres. The cavalry brigade held their own at the Riverstown ford.

Each brigade practically held its own bank of the river, and the cavalry brigade had succeeded in destroying the railway at Kildare.

The cavalry brigadier speaks highly of the performance of the officer to whom was entrusted the duty of getting through the enemy's cavalry and cutting the railway. The Curragh cavalry sounded a trumpet in Kildare, which gave this officer notice of their approach, and enabled him to evade them.

Remarks.

Cavalry Brigade.—The troops were well handled during this day's operations, and forestalled the defenders at every point. Strictly speaking, the brigadier might be taxed with exceeding his instructions in employing his entire force on what was intended to be a minor operation. He was merely told to push forward a reconnaissance towards Kilcullen and Newbridge, and to despatch a special patrol to destroy the railway. The latter duty was very cleverly accomplished, but the reconnaissance was made in such strength that it brought about more fighting than the General at Roscrea desired, having in view the hard work in store for the brigade.

Curragh Column.—The brigadier's orders are not well drawn up. The contact squadron is ordered "to seize Vicarstown Bridge, if possible," but the remainder of the regiment are detached to Monasterevin and Riverstown without any expressed object. The important mission assigned to the cavalry from the headquarters in Dublin of endeavouring "to reconnoitre the country to the west" is not touched upon.

In the case of the cavalry, the hour at which they were required to reach the line of the River Barrow would have been preferable to the hour of departure from Newbridge, and where other units are not concerned (*e.g.*, G battalion), it would have been sufficient to order the head of the column to be at the "Cross Roads, S.W. Duneany Wood," at 9 A.M., leaving the responsibility of starting at the proper time to the commanding officer.

Under the head of "cyclists," no task is assigned to them; they are merely to rendezvous at French Furze, a quarter of an hour before the centre column. It is only on reading the orders to the contact squadron that the object they have in view is apparent.

The duty and route of half G battalion is specified, but no mention is made of the other half battalion.

The order of march of the columns to rendezvous at the camp of F battalion and French Furze Green is not given. The strength and composition of the advanced guards are not mentioned. As no Commanders were appointed to these separate columns, omissions of this kind in orders would inevitably entail delay in their departure.

The action of the cavalry brigade obliged the brigadier of the Curragh column to send detachments of infantry to the extreme flanks of the zone of operations after a fatiguing march. This entailed a distribution of his force for the following day which in other circumstances he would probably not have adopted, and which was hardly contemplated in the special idea.

Wednesday, 16th August, 1893.

General Idea.

A cavalry brigade of the invading force is encamped on the Great Heath of Maryborough. One of the defending columns holds, in the county Kildare, the left bank of the River Barrow.

Special Idea (Cavalry Brigade).

From General Officer Commanding, Roscrea.

To Lieut.-Col. A——, Commanding Cavalry Brigade, Maryborough Heath.

ROSCREA,

10 P.M., *15th August*, 1893.

1. Your despatch regarding enemy's strength and dispositions just received.

2. Advance to-morrow morning, and watch closely the River Barrow from Dunrally Bridge to Monasterevin. If opposed by superior numbers, fall back slowly on Maryborough; but harass the enemy during his passage of the river, and dispute his advance at every favourable opportunity during your retirement.

3. To support you, I am sending an infantry division (imaginary), the head of which is due to reach Mountrath at 6 P.M. to-morrow.

Brigadier's Orders, 15th August, 1893.

The brigade will occupy the same position vacated this morning, and must be ready to take the initiative by 5.50 A.M., but will not move before 6 A.M.

In order to dispute the ford as effectually as possible, the contact squadron will be reinforced by a squadron D Regiment, now about Fisherstown, and R.H.A. batteries, 6 guns, and reserve squadron C Regiment.

The line of resistance will be as follows, and will be held up to the hours named, unless ordered to the contrary, viz.:—

1. Jamestown, Fisherstown, Courtwood, Vicarstown, up to 7 A.M. Positions already held in advance, viz., C Regiment to G. 9, Fisherstown Ford, and Dunrally Bridge should be held as long as possible.
2. Ballybrittas Cross Roads, H. 11, up to 7.30 A.M.
3. Cross Roads D. 11, Cross Roads E. 14, up to 8.30 A.M.
4. The Togher, Nutgrove, D. 13, till 9 A.M.

The machine-guns and squadron C Regiment, on vacating Fisherstown Canal Bridge, will work to the main Ballybrittas Road, and with its headquarters.

The line of retirement for R.H.A. will be by road running through F. 11 and 12, with a squadron for each regiment as escort.

The section R.E. will proceed to Vicarstown, and barricade the canal bridge and roads through the village.

Position of brigadier. Fisherstown, till 7 A.M.; Bellegrove Lodge, till 7.30 A.M.; Nutgrove, D. 13, 9.30 A.M. All information to be forwarded to him. No bridge to be permanently destroyed.

SPECIAL IDEA (Curragh Column).

Brigadier's Orders, 15th August, 1893.

The position of troops when operations commence to-morrow, moving at 6 A.M., will be as follows:—

Cavalry. 2 squadrons holding Monasterevin Bridges; 1 troop at Riverstown, left bank of river; 1½ squadrons at Dunrally Bridge.

R.A. 1 battery at Lugg Hill, 1 battery at Riverstown.

R.E. 1 section Riverstown, 1 section Dunrally Bridge. Pontoon troop, Riverstown.

H battalion. 3 companies, 1 machine-gun at Riverstown; 2 companies in Monasterevin, at bridges; 1 company escort to guns at Lugg Hill.

F battalion at Crosskeys Camp.

H battalion. 1 machine-gun at Dunrally Bridge.

K battalion at Crosskeys Camp.

G battalion. 3 companies Dunrally troops; 3 companies Crosskeys, Cross Roads, facing S.

(*General Idea.*)

2 squadrons E Regiment proceed *viâ* Jamestown, Ballybrittas Road, and Grand Canal.

1 troop E Regiment will cross the ford at Riverstown, and reconnoitre to the front, supported by 2 companies H battalion, sent across the river to secure Fisherstown Bridge, and cover construction of pontoon bridge over the Barrow.

1 company H battalion on left bank at Riverstown.

This force will be reinforced by F battalion, and battery R.A. 1 battery R.A. (escort company, H battalion) will take up a position on Lugg Hill. The section R.E. will assist the repair of Fisherstown Bridge, if destroyed.

Lieut.-Colonel B—— will command the above force, and will endeavour, if he finds in strength, to keep him in check until 9 A.M.

Position of Brigadier.—Riverstown, 6 A.M. 1½ squadrons E Regiment, cyclists, 1 machine-gun, 3 companies G battalion, and R.E. section, will be at Dunrally Bridge, supported by remainder G battalion, and 4 companies K battalion.

This force will push forward to gain possession of Vicarstown Bridge, repair it, if destroyed, proceed towards Emo, and endeavour to cut the enemy from Maryborough.

Baggage will be packed at 6 A.M. in the present position of wagons. Baggage of R A. and E Regiment to leave Riverstown, 6 A.M. Join other baggage column on Crosskeys-Duneary Road, E. of Ashgrove. 2 companies K battalion, baggage guard.

NARRATIVE.

Events in the North.

Desultory skirmishes along the two parallel roads from Monasterevin to Maryborough Heath, with no very important results until about 8 A.M., at Jamestown. Curragh cavalry are checked by two guns in action on the road, supported by 2½ squadrons cavalry brigade. Curragh cavalry ordered out of action.

9 A.M. Retirement continued slowly, being reinforced by two machine-guns and a squadron from the ford at Riverstown. The 2 guns R.H.A. joined the battery in the neighbourhood of D. 13.

10.30 A.M. At Togher Cross Roads about this time, 2 companies of G battalion in position fired volleys into machine-guns descending hill towards them, 2 squadrons C Regiment in support. Both parties well placed, and no forward movements on either side attempted. Machine-guns ordered back (as they could not have descended the hill), and both parties to hold their positions.

11 A.M. Companies reinforced by infantry column coming up from Riverstown *viâ* Ballybrittas.

11.20 A.M. No further movement till cease fire sounded.

Events in the Centre.

6 A.M. The passage of the Barrow commenced by the sappers attempting to make bridge without proper support, and without driving troops from further bank. Working party ordered to desist with half their number out of action.

6.20 A.M. Sappers reinforced by 3 companies H battalion, with F battalion in reserve.

Half-troop cavalry endeavoured to cross by ford, but were not permitted; they retired, and joined squadron at Monasterevin.

Very heavy fire, assisted by the battery in position at Riverstown. All troops that could be enfiladed ordered back. But, as no forward movement was made, things remained *in statu quo* until 7 A.M., when a punt was seized, and, under very heavy fire, it and a pontoon were launched, and a company of infantry sent across the river. Hussars evacuated position, and infantry took possession of the hedgerows.

7.5 A.M. Engineers commence constructing the bridge, and complete it at 9.5 A.M. While this was proceeding, the 4 guns on Lugg Hill were engaged with 4 guns of cavalry brigade at H. 11, and at 6.30 a second battery of cavalry brigade joined that at H. 11, and a second field battery that on Lugg Hill.

These two latter batteries must have also inflicted severe loss on the cavalry retiring from Riverstown.

When the bridge was completed, 1 battalion and 3 companies, with machine-gun, advanced, and, finding Fisherstown unoccupied,

proceeded, *viâ* Rath House and Ballybrittas, towards Maryborough and Cross Roads E. 12.

These troops were not again engaged.

Events in the South.

6 A.M. The 2 squadrons D Regiment delayed the advance of the Curragh column by holding the road between Dunrally Bridge and Vicarstown until arrival of reinforcements at 6.35 A.M. There (at Vicarstown) the canal bridge was barricaded, and neighbouring buildings occupied.

6.45 A.M. The position is attacked by 1 company (G battalion) and 10 cyclists; attack repulsed. It was renewed again at 6.55 A.M. 12 sections rushed towards the bridge in succession. There was no covering fire, and the sections were brought straight up the road without deploying; attack failed, and advance of column delayed 30 mins.

7.30 A.M. Advance resumed, and checked again at Vicarstown Church and Cross Roads, G. 14. This enabled the squadron (13th Hussars) to be safely withdrawn from Courtwood Bridge, which was very well done.

8.10 A.M. About 8 o'clock two squadrons (D Regiment) and a battery passed French Farm, E. 13, towards Nutgrove, D. 13. Here 10 mins. were available to barricade the road.

8.30 A.M. The barricade was held by 2 squadrons (D Regiment); the view forward was only about 100 yds., and there were no patrols in front. A squadron and 2 guns from Fisherstown appeared on the barricaded road, and were delayed 10 mins. to allow of the barricade being removed. A little before this, at Farrell's Farm, E. 13, a battery R.H.A. in column of route, and a squadron of hussars were fired on by dismounted cavalry, and delayed 10 mins.; G Regiment moving, under fire from barricade and guns, on Nutgrove.

8.40 A.M. They propose to deploy, and are allowed 10 mins. to do it.

8.55 A.M. 1½ batteries (6 guns) at Nutgrove are fired on from Moyanna Church, F. 14, at 3,700 yds. The R.H.A. did not reply to this, as the range was great.

9.15 to 10.15 A.M. These guns continued in action till 9.50, when they moved to Burrow Hill, E. 13, and again fired on the R.H.A. at Nutgrove. G Regiment must have suffered severely from the fire of the batteries on Nutgrove; and the field batteries, also on the move when changing position, must have been much delayed. About this time 3 companies and machine-gun with cyclists attacked the H.A., and 4 squadrons of hussars at Nutgrove (the hussars had been reinforced by 2 squadrons from Cross Roads, E. 14). The attack failed, and infantry were ordered back. At 10 A.M. the infantry were reinforced by 3 companies (K Regiment), when they again attacked, this time successfully; the fire of the field batteries from Moyanna Church materially assisting.

10.20 A.M. The Umpires considered the position untenable, and guns retired on Maryborough covered by the cavalry.

Infantry took possession of Nutgrove, and hostilities ceased for the day.

The attack by Dunrally was successful, but there was considerable loss on both sides.

The cavalry brigade carried out the task set them, and lost no opportunity of retarding the advance, which was slow, especially on the right (north), where the brigade retired as it pleased, and was in no way pressed.

Few attempts were made to turn troops in position by flank attack.

A trumpet was sounded in the neighbourhood of Vicarstown by the cavalry brigade.

Remarks.

Cavalry Brigade.—The brigadier of the cavalry brigade carried out his instructions to the letter.

Curragh Column.—The orders to the Curragh column are not explicit. With the exception of the column to advance by Dunrally and Vicarstown bridges, the troops are despatched without any objective, *e.g.*, "2 squadrons (E Regiment) proceed *viâ* Jamestown, Ballybrittas Road, and Grand Canal," with no duty or destination assigned to them. It is not clear what Lieutenant-Colonel B——'s command was to be; the force proceeding by Monasterevin and Riverstown, the latter only, or the battery and escort on Lugg Hill. His orders to "endeavour to keep the enemy in check until 9 A.M." do not act up to the spirit of the despatch from Headquarters, which contained emphatic instructions to "drive west any hostile troops" met.

No distinct instructions are given for the construction of a bridge, although from the order to H battalion it is assumed that a pontoon bridge is to be laid. Its position, however, is not described, nor is the operation entrusted to any particular portion of the force.

Presumably at 6 A.M., the troop of E Regiment at Riverstown were to cross the ford, supported by 2 companies H battalion, sent across the river to secure Fisherstown Bridge, and cover construction of pontoon bridge; but it is not stated how the infantry are to cross the river.

No commander was nominated to the left (Dunrally) column, consisting of cavalry, R.E., cyclists, infantry, and machine-guns, and entrusted with an important operation. The order to this column assumed that, after gaining possession of the bridge, the enemy would be to east of Emo-Vicarstown Road; a rather doubtful assumption, and one which, if not correct, would have subjected the force to a long flank march on an exposed road. No alternative was left to this column by the wording of the orders; but, fortunately for him, as events turned out, the officer who assumed command decided to detach a couple of companies only towards Emo; while with the bulk of his force he proceeded by the Moyanna Church Road, driving back a cavalry regiment, and succeeding eventually in silencing the artillery on Nutgrove Hill, D. 13, which would,

had he complied strictly with his orders, have punished his force severely.

The construction of the pontoon bridge was commenced under difficulties which had not been anticipated. Had the two companies of infantry reached Riverstown at the appointed hour the cavalry could have crossed the ford and dislodged the enemy lining the right bank before reinforcements came to their assistance. In addition to the delay in getting the pontoon equipment ready, caused by the effective fire of the enemy's dismounted cavaly, the operations of the preceding day led to a section of the R.E. being detached to Dunrally Bridge, and thus weakened the strength required at Riverstown. Nevertheless the bridge was not laid in a business-like manner; there was too much noise and a palpable want of instruction and drill.

Thursday, 17th August, 1893.

General Idea.

Hostile forces are in contact on the line Emo—Rock of Dunamase.

Special Idea (Cavalry Brigade).

At 11.50 P.M. on the 16th August, the officer commanding the cavalry brigade at Kilminchy receives the following orders from the General Commanding at Roscrea:—

Roscrea,
11 P.M., *16th August*, 1893.

1. Telegram received announcing that the 1st Infantry Division have just reached Maryborough. I am now issuing instructions to the General Commanding to attack the enemy to-morrow, and force him back into the county Kildare.
2. I wish you to assist in effecting this. During the retreat of the troops opposed to us your mission will be to hang upon their flank, and watch your opportunity to forestall them at some convenient point on their line of communication on the east side of the River Barrow. Possibly the Curragh might answer the purpose.
3. My headquarters will be moved to Maryborough to-morrow morning.

Brigadier's Orders, 17th August, 1893.

The brigade will be ready to enter the zone of operations by 7 A.M., and will march, complete, to Old Ballybrittas, *viâ* The Togher and south corner Emo Park.

At the same time officers' patrols will be sent out to gain intelligence of the enemy.

D Regiment will take that portion of country embraced in the triangle, Maryborough Heath, Dunrally Bridge, and Fisherstown.

C Regiment. Maryborough Heath, Fisherstown, and Monasterevin.

The brigadier anticipates being at Old Ballybrittas by 7.45 A.M., to which point information should be sent. Further movements must depend on circumstances and information received.

The order of march as follows:—

C Regiment, 2 squadrons with machine-guns, R.H.A., remainder of C Regiment, D Regiment.

Special Idea (Curragh Column).

From Deputy Adjutant-General, Dublin.
To Lieut.-Colonel X——, Commanding Curragh Column, Maryborough Heath.

Dublin,
1 A.M., *17th August*, 1893.

1. It is reported on unquestionable authority that a large force of infantry are

marching to oppose you. Billets have been drawn at Mountrath, Castletown, and Borris-in-Ossory for 3,000 men; at the two latter places camps are being marked out for 5 battalions.

2. Withdraw at once to the east of the River Barrow, and make a stand there until to-morrow morning, when you may retire on the Curragh.

Brigadier's Orders, 17th August, 1893.

In accordance with general and special ideas issued from Dublin, 1 A.M., 17th inst., the column will retire from Maryborough to each bank of River Barrow, holding all passages over the river.

The following will be the order of march:—

E Regiment. 2 squadrons by roads Togher, Ballybrittas, Jamestown, Monasterevin; and Glenmolire House, Hermitage, Monasterevin, to hold bridges over the river at that town, preparing both for demolition, and also the canal bridge half mile west. The squadrons will furnish an escort to 2nd Battery R.A. 1 squadron by Vicarstown to Dunrally Bridge. 1 troop by National School, F. 14, road by canal to Fisherstown on to pontoon bridge at Riverstown. 1 troop by E. 13, Rath House to Riverstown. These parties will keep up lateral communication between the columns, and will hold the bridges, if possible, till arrival of infantry.

R.A. 2 batteries by Togher, Ballybrittas, Monasterevin, to Lugg Hill.

R.E. 1 section with K Regiment to Dunrally, preparing for demolition Dunrally Bridge, and Vicarstown. 1 section with G Regiment to Riverstown, preparing for demolition Fisherstown Bridge. Pontoon troop will hold Riverstown Ford, and render the bridge impassable till arrival of cavalry.

H battalion will march by E. 13, Rath House to Riverstown, covering that bridge.

F battalion will form escort to baggage column by Togher, Ballybrittas Road, detaching 2 companies to bridges at Monasterevin, and 1 company to Lugg Hill.

G battalion. By National School to H. 13 and Fisherstown, forming a reserve to H battalion at Riverstown.

K battalion. By National School, Vicarstown, to Dunrally.

Baggage. Parked in front of respective regiments at 5.30 A.M.

Hour of march. The R.A., F battalion, baggage column will leave at 5.45 A.M., not to enter zone of operations till 6 A.M.; the remainder of troops will march from camp at 6 A.M.

Formation. Each column will send on 1 company of infantry to support cavalry in holding bridges, followed by remainder with strong rear guards.

Cyclists will accompany the brigadier by E. 13, Rath House Road.

NARRATIVE.

The troops proceeding *viâ* Dunrally and Riverstown retired to their respective stations on the River Barrow without molestation. The baggage column escorted by F battalion made a mistake in the road, and this column had to go round by Emo village; this delayed the retirement by half an hour.

7 A.M. Thus at 7 o'clock the column had reached Cross Roads C. 12, and here was attacked by cavalry brigade.

7 to 9.15 A.M. From this time till 9.15 a continuous action was fought along the main road leading from Maryborough to Monasterevin.

7.45 A.M. C Regiment and a battery R.H.A. attacked the rear guard at D. 11. Part put out of action, remainder continued the retreat, and were again attacked at E. 11. Another portion was put out of action, and retirement continued until Ballybrittas was reached at 8.15.

8.15 A.M. Here 2 companies were detached to protect the left flank of the column moving along the northerly of the two roads to Monasterevin. D Regiment meanwhile had advanced along this road nearly half an hour earlier, driving back a patrol of the lancers, and entered the main road at Jamestown about 7.50, and attacking with 1 gun and dismounted fire the few lancers at the canal bridge, pushed on into Monasterevin at 8.30 A.M.

About this time, at F. 10 on the main road, 2 machine-guns coming into action were much exposed to fire, and the horses were killed. But five minutes later 2 guns of the R.H.A. took their place, inflicting severe loss on the rear guard. D Regiment sent on 1 squadron after the retreating cavalry round Moreabbey Park towards Lugg Hill, and another with 2 guns back to the Canal Bridge. There at 9.15 A.M. F Regiment with the baggage column were sandwiched between the fire of guns. They were considered as totally routed, the majority killed, and baggage column captured.

9.30 A.M. Monasterevin was now held by the cavalry brigade. The squadron of D Regiment who had proceeded to Lugg Hill, finding themselves opposed by an equal force, sent back for a gun, which on arrival preceded the squadron, and walked into an ambush which had been laid; 2 guns of the R.A. from Lugg Hill being brought on to the road. The Curragh squadron passed through them, and the squadron cavalry brigade must have suffered heavily.

The cavalry brigade moved on to the Curragh as ordered, and the Curragh column to Crosskeys and Riverstown Camps.

The Curragh column made good its retreat, but with the loss of a battalion and its baggage. The cavalry brigade secured the bridge at Monasterevin, and so were in a position to cut in on the line of communication, and take up their position on the Curragh.

The horse artillery on some occasions preceded the cavalry along roads and through villages.

The artillery of the Curragh column rendered practically no assistance during the day.

REMARKS.

Cavalry Brigade.—The flank march of the brigade was well conceived and successfully carried out. The advanced portion was checked at first, by accident rather than design, the enemy having on leaving Maryborough Heath taken the wrong road; but it made up for the time lost by pushing on, with one unnecessary halt, through Old Ballybrittas, circumventing the baggage column, and making an entry on the main road at Jamestown, whence Monasterevin with but slight opposition was occupied. On the other hand, had the escort to the baggage taken the right road, the column would have reached Jamestown half an hour sooner, forestalling the enemy at that point.

The "unnecessary halt" above referred to occurred in D. 11, when a squadron dismounted on being fired at by a section of infantry placed across a road at a range of 660 yds., the country being thickly wooded on either side. Not satisfied with replying with dismounted

fire, a gun was brought into action against the infantry section, causing a waste of valuable time.

The major-general observed that the brigadier was not at Old Ballybrittas at 7.45 A.M. as stated in his orders. If his presence was required elsewhere, he should have sent a Staff officer to receive the intelligence collected by his cavalry patrols which was to be sent to this point. It is considered, however, that he would have been better placed at Old Ballybrittas or with the advanced portion of his force; his object was to steal round the enemy's flank and reach the line of the River Barrow before the hostile infantry. In heavily engaging the rear guard, he was defeating this object, inasmuch as he was pressing back the enemy towards the river, while every moment's delay increased the distance which separated him from the advanced portion of his brigade.

Immediately the squadrons and guns reached Jamestown and headed the baggage column, information should have been sent back to acquaint the brigadier of the achievement. In his anxiety to reach Monasterevin, however, the officer commanding on entering the main road never even looked down the road; had he done so, he would have seen the leading infantry of the escort to the baggage within 800 yds. of him.

On returning to the canal bridge the advanced portion of the brigade should have detached a patrol along the tow path in the direction of Fisherstown, leaving a support in observation of the movements of the enemy's baggage column. Where the action of troops is restricted to the thoroughfares, and such small areas as permission to manœuvre over has been obtained, a false representation of what would really occur in war is given. Checked as the baggage escort was, the officer in command would in other circumstances have, no doubt, deployed some infantry between Jamestown and the canal, to the discomfiture of the cavalry and guns holding the bridge; but in no case should the cavalry brigade have neglected to patrol the canal. The only soldier to be seen on the tow path was an E Regiment orderly, who had taken refuge there after his escape from Monasterevin, the officer he accompanied having been made a prisoner while carrying his despatch to the artillery on Lugg Hill. Subsequently a patrol of the cavalry brigade passed in a northerly direction along the canal.

Curragh Column.—It was of the first importance to secure the safety of the baggage and train, and it is not understood why the longest route should have been selected, when time was so limited. It is suggested that the withdrawal might have been accomplished with almost a certainty of success had the baggage been sent by the Moyanna National School and Vicarstown Bridge Road under cover of artillery in position D. 13. The prescribed idea of operations at this point, and the conditions of *terrain* favoured the guns taking up a position on the Nutgrove Hill, to delay any forward movement on the part of the cavalry brigade, draw the fire of its batteries, and prevent their interfering with the baggage and its escort.

This route was far shorter than that by Ballybrittas and Monas-

terevin, and the guns at D. 13 would not have been disadvantageously placed had tactical necessity demanded ther employment at a later stage in a more central position. Having effected the primary object, they might have moved to G. 14, and thence by H. 13, 12, 11 to "255" between Fisherstown House and the river, whence they would have been able to engage any of the enemy moving in the vicinity of Jamestown on the main Maryborough-Monasterevin Road, and cover the approaches to Riverstown. In sending his batteries to Lugg Hill, the brigadier deprived himself of their services for the day. With an infantry division closely pursuing, it might have been taken for granted that the cavalry brigade would assail the flanks; but Lugg Hill was from 5,000 to 7,000 yds. from the nearest visible points on the Monasterevin or Dunrally Roads.

Placed in such a dilemma, and knowing that he would find support from the centre column debouching near Rath House, the officer commanding the baggage column should have diverted the baggage at Ballybrittas from the Monasterevin Road, strenuously resisting with his infantry the further progress of the enemy. Relieved of anxiety for his baggage, which would have been screened from view throughout its route to Fisherstown, and thence have been under the protection of the guns at Lugg Hill, an opportunity might have been found for executing a reprisal against the cavalry brigade, at this time widely segregated.

The brigadiers of both forces seem to have ignored the fact that a division of infantry was closely pressing the rear of the Curragh column, which would have relieved the cavalry brigade of that duty, while the home force should have taken measures to protect its baggage from attack in rear.

Friday, 18th August, 1893.

General Idea.

A defending force is retiring in an easterly direction through Crosskeys; while a hostile cavalry brigade threatens its line of communication.

Special Idea (Cavalry Brigade).

At 11.30 P.M. on the 17th August, the officer commanding the cavalry brigade receives, in bivouac at Old Kilcullen, the following message by signal from the General Officer Commanding at Maryborough.

Maryborough,
11 P.M., *17th August*, 1893.

Retard and harass the enemy during his retirement, and endeavour to drive him north of the G.S. and W. Railway before he can reach the Curragh.

Brigadier's Orders, *18th August*, 1893.

Rendezvous at Old Kilcullen at 6.20 A.M.

C Regiment with machine-guns will move to French Furze, *viâ* Sunny Hill Cottage, Harristown, and Ballysax Roads.

D Regiment will move to junction of Suncroft Road with Curragh, *viâ* New Park and Ballysax Church and Suncroft Road.

R.H.A. in rear of C Regiment; patrols will be pushed as far to the front as possible to gain information of the enemy's line of advance, C Regiment taking

the country bounded by the main Monasterevin Road and French Firs, Tully House, Nurney Road.

D Regiment, the country east of Tully House, Nurney Road.

Should opportunity offer I propose to concentrate the whole force for a general attack towards the north.

Position of brigadier, with C Regiment at French Firs. All information to be sent to him.

SPECIAL IDEA (Curragh Column).

Brigadier's Orders, 18th August, 1893.

Order of march. E Regiment. 1 squadron to reconnoitre by Kildare, Eagle Hill, Suncroft, towards the Curragh, protecting their right flank.

1 squadron through Kildangan to railway bridge L. 9 to reconnoitre towards Mooretown House, Kildare Station Road, to Little Curragh, protecting its left flank. This squadron will detach 1 troop at entrance of Kildare Station Road on to the Little Curragh to protect advance of guns.

1 squadron to reconnoitre Kildoon-Tully House Road, French Furze. 1 squadron by Kildangan, Duneany Wood to Curragh, through Kildare.

All information to be sent to the brigadier on the Kildangan, Duneany Wood, and Kildare Road.

R.A. By Kildangan, Duneany Wood to Kildare Station, escort 1 company the Buffs; the batteries formed up head of column, Crosskeys 6.15 A.M.

F Regiment. By Kildangan, Duneany Wood, Grey Abbey to Kildare. 1 company escort to battery. The regiment to be ready to leave camp at 6.15 A.M.

H Regiment. By Kildangan, Duneany Wood, Grey Abbey, to Kildare. ½ battalion escort to baggage. Regiment to be ready to leave camp at 6.15 A.M.

G Regiment. By Bog Road to railway bridge L. 9, to be at Kildare Station at 8.45 A.M.

K Regiment. By Kildangan, Nurney Castle, to Tully House and French Furze, head of column to be at Crosskeys at 6.15 A.M.

R.E. 1 section with R.A., 1 section with F Regiment, pontoon train with baggage, rendezvous in rear of artillery at 6.15 A.M.

Baggage at Crosskeys parked 6 A.M. Riverstown baggage in rear of pontoon train 6.15 A.M.

Cyclists will accompany the brigadier.

No portion of the above force to be east of the Carlow branch at 6.15 A.M.

NARRATIVE.

6 A.M. Infantry, imaginary, of invading army shelled when crossing Courtwood Bridge, as a practice in indirect laying.

6.15 to 10 A.M. Right column Curragh column reached Tully at 9.30 A.M., and were ordered to wait for orders, which they did until 10 A.M., when they received orders to move on Kildare and join column advancing on Curragh.

6.15 to 8.50 A.M. Centre column reached Kildare about 8.50 A.M., driving out patrol of cavalry brigade.

6.30 to 8.50 A.M. Left column arrived at Callachknock Cross Roads unopposed. 1 company detached as escort for the guns going on to the Curragh. 1 gun coming into action to be ready for cavalry reported as driving in E Regiment along the Callacknock Road.

7.45 to 8 A.M. Desultory skirmishing attended with no important results took place at Q. 8 and O. 7.

8.15 to 9.15 A.M. At Q. 8, C Regiment bringing up a machine-gun the enemy were ordered to retire, and C Regiment held Tully House against 1 company of F battalion until ordered to retire to

the Curragh. Skirmishing also went on in the neighbourhood of O. 7. Curragh column cavalry were driven off the Curragh and chased into Kildare by the enemy, who in turn were driven off by artillery in action on the road.

9.15 A.M. Guns and G battalion arrive on the Curragh, the latter extending for attack. H battalion in reserve, field batteries trotting towards Walsh's Rath. 2 batteries R.H.A. and 3 squadrons C Regiment, who had been in the neighbourhood of Gibbet Rath, were ordered up with D Regiment towards No. 8 Rath, where the guns unlimbered. Then observing the unprotected state of the field batteries, the R.H.A. moved towards and took up a position on No. 5 Rath, and engaged a battalion of infantry in close formation near Mountjoy Stables at 9.18 A.M.

The cavalry deploy, D Regiment on the left, close to the edge of the Curragh, moving towards Mountjoy Stables. 2 squadrons D Regiment charge and rout a squadron of E Regiment, and another squadron of the same regiment wheeling to its left attack a company of infantry extended. C Regiment sweeps down on the field batteries, who manage to get two rounds of case into them, overthrow a squadron of E Regiment who advance to meet them, and after a short pause wheel to the left, charge a company of infantry which formed rallying square, pass this company to attack the main body of the infantry, who had been under fire of H.A. guns for three or four minutes. Meanwhile 2 squadrons of E Regiment had unobserved moved round the left flank of the H.A., and were prepared to charge the guns when cease fire sounded.

What would have been the result of this mixed *mêlée* it is impossible to say. The Curragh column were in Kildare, advancing to the Curragh. The guns if captured could not have been carried away, and though the infantry (1 battalion) must have suffered severe loss, yet the cavalry brigade must have suffered even more, and their artillery being attacked in rear would have probably been captured.

The Curragh column attained its object, and, though its progress to the Curragh had been delayed, it was at the expense of serious loss to the cavalry brigade, which, except their one effort as the infantry debouched, had made no serious attempt to harass and retard the enemy's advance.

Remarks.

Cavalry Brigade.—During the last day's operations the cavalry brigade lay dormant, and its contact squadrons displayed masterly inactivity. The instructions to the brigadier were (1) to retard and harass the enemy during retirement, and (2) to endeavour to drive him north of the railway. The first injunction was ignored, the second but indifferently attempted.

Had the brigade expected to encounter a strong force of cavalry, the Curragh, no doubt, offered the most advantageous ground for its attack, but it was imprudent to allow the enemy's infantry to gain a footing in the open ground unmolested. By prearranging a more effectual reconnaissance the brigadier would have discovered how

weak were the columns marching by widely separated roads, and have been enabled to carry out a succession of attacks which would have disorganized the Curragh column before its concentration at Kildare.

Curragh Column.—The staff did not work out the order of march with sufficient care. There is no mention of the roads by which the cavalry were to leave Riverstown, or the hour at which the several squadrons were to start.

The baggage of the infantry was to be at Crosskeys at 6 A.M., its escort was not to leave camp till after 6.15; but in the meantime K battalion was between the baggage and its escort, having reached Crosskeys at 6.15. On the Riverstown Road at this time the following details were halted in the order named, the head of the column at Crosskeys:—R.A., R.E., escort to guns, pontoon train, and baggage. There are no instructions as to the order in which the troops and baggage on these roads, or those in readiness in camp, were to move off: a matter of the first importance.

There was nothing to prevent the exact time and order of precedence being given; this was all the more necessary as nearly the entire force was committed to cross the Carlow Railway by the same bridge. In fact the orders as worded entailed further instructions being communicated by the Staff at the hour of rendezvous, leading to inconvenience, if not confusion, at a time when their attention would probably be required elsewhere.

If patrols instead of squadrons had been entrusted with the reconnaissance of the various roads by which the columns were to retire, a body of cavalry might have been kept in hand for offensive purposes. What was required was careful exploration, which can be effected by a few well trained men, while small detached patrols keep up communication with the front and laterally.

The strategy of the brigadier while retiring to the Curragh is open to criticism. He had a cavalry brigade on his line of retreat, and was being pursued by infantry. The latter being imaginary, he may have neglected to take them into his calculation, but even had he been justified in so doing, the distribution of his force and the arrangements of his columns were faulty. It is a question whether any advantage was gained by concentrating at Kildare. It was known that the enemy's guns could be brought to bear upon the approaches from Kildare at effective ranges from the commanding positions of Nos. 5 and 8 Raths or Walsh's Rath, with good manœuvring ground for cavalry. Being within striking distance of the enemy, the columns were too widely dispersed; the organization of the force as a fighting body was therefore seriously interfered with, the frontage at one point extended over 4 miles, which was excessive for a weak brigade.

An alternative would have been to march the brigade by Eagle Hill and Suncroft; thence to have arranged for a simultaneous debouch upon the Curragh by the Cuningham and Martinstown Roads, with the baggage column held back on the Suncroft Road until the infantry, sheltered by the impassable barrier of the encampments and under cover of the field artillery, had effected an exit.

This concluded the Series I of the manœuvres, carried out as far as possible under service conditions and in a new country. All ranks must have benefited by the practical experience gained, not only (as is so often the case) the brigadiers and their staffs.

The cost of this series was 397*l.*, and this must be considered small, as it should be remembered that in all five camping grounds were occupied, and the operations were not confined to the roads. In such cases there must be accidental and unavoidable damage, and it may be mentioned that the 15th August, being observed as a holiday, numbers of the country folk came to witness the manœuvres, and in trying to gain admission to the camps broke fences, claims for which were submitted against the troops.

The conduct of the troops was exemplary, and there was practically no malicious injury whatever.

Second Series—Curragh Field Manœuvres, September, 1893.

A second series of field manœuvres was carried on in September in the vicinity of the Curragh, between troops from the Dublin and Curragh districts, lasting from 13th to 16th September inclusive.

A field column consisting of 1 squadron cavalry and 3 battalions infantry (each battalion about 350 of all ranks), under command of Colonel H——, marched from Dublin on 13th September, encamping that night at Bishop's Court, on ground kindly placed at its disposal by the Earl of Clonmell.

The column left its rendezvous in the vicinity of Dublin at 10 A.M., reaching Bishop's Court, 11½ miles distant, at 2 P.M.

The dress was marching order, with forage caps, one battalion carrying Wallace spades. Weather fine.

Continuing its march on 14th, it was opposed by force from the Curragh[1] (distant 16 miles). Weather fine.

14th September.

General Idea.

A field column of an army, having its headquarters in Dublin, is detailed to contend against a hostile brigade known to be in South Kildare.

Special Idea (Field Column).

From General Officer Commanding 1st Infantry Division, Dublin.
To Officer Commanding Field Column, Bishop's Court House.

Dublin,
7.55 P.M., *13th September*, 1893.

1. Spies report enemy's cavalry are at Newbridge.
2. Continue your march to-morrow morning, cross the Liffey by such of its passages as, after careful reconnaissance, may appear most suitable, and driving south any of the enemy you may meet, take up a defensive position on the Curragh, preferably to the west of Hare Park Hospital.

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[1] 1 squadron cavalry; 3 battalions infantry.

SPECIAL IDEA (Hostile Brigade).

At 8 A.M. on the 14th September the following despatch from the General Officer Commanding at Athy is handed to Lieut.-Colonel K——, commanding the brigade.

ATHY,
5.30 A.M., *14th September*, 1893.

1. Information by telegram from a reliable source received that hostile patrols were last night in the vicinity of Kill, and that the field column had made preparations for an early march.

2. Reconnoitre the line Victoria Br. Watch Ho. Cross Roads, and having ascertained the enemy's strength and lines of advance, make such dispositions as will delay his progress, without committing yourself to an engagement on the north side of the Liffey so serious as to jeopardize your line of retreat.

3. If opposed by superior numbers, fall back fighting towards the west of the encampment, making a determined stand when you reach the Curragh on ground favourable to defence.

Area of Operations (*refer to Map*).

1. G.S. and W. Railway.
2. Sallins, Rathmore.
3. Rathmore, Castlemartin, Martinstown Ho.
4. Martinstown Ho., Kildare.

The commander of the Dublin field column carried out the orders in the above special idea successfully, having marched on three roads, with the baggage and its guard on the centre one, the columns reunited at Connell's Ford, and proceeded almost unchecked on to the Curragh; but the baggage fell into the hands of the hostile brigade when nearing the Curragh, and the baggage guard (2 companies) were placed out of action. The cavalry scouted, and worked admirably.

The hostile brigade occupied positions commanding the two roads leading on to the Curragh from Newbridge and Connell's Ford, and, owing to a mistake in the delivery of a verbal order, one battalion was despatched in a direction where it could have been of no possible use; no doubt it was owing to this accident that the field column effected almost a bloodless entry upon the Curragh.

The official remarks on this incident are quoted in full.

"The importance of committing orders to writing was exemplified on more than one occasion to-day. A battalion of the hostile brigade, which should have been, according to the brigadier's original instructions, in the vicinity of Freeth's Hills, guarding the Connell road debouch, was, by a mistaken verbal order, sent to Athgarvan. The force of infantry at the brigadier's disposal therefore, at the very time he was instructed to make a 'determined stand' was only 2 battalions of 4 companies each, widely distributed, against 3 battalions of 6 companies each well concentrated."

The "cease fire" sounded at 2.30 P.M.

15th September.

Upon the following day manœuvres were carried out, based upon the following general and special ideas :—

GENERAL IDEA.

A defending force is advancing from Monasteverin and Rathangan, while an invading force is retiring upon Donard.

SPECIAL IDEA (Defending Force).

Having reached Kildare at 8 A.M. on 15th September, the officer commanding the advanced guard is handed the following telegraphic despatch :—

From A.A.G., Portarlington.

To Officer Commanding Advanced Guard, Kildare.

PORTARLINGTON,

7.45 A.M., *15th September*, 1893.

1. Your No. 321 of yesterday just received.

2. A regiment of cavalry was sent to Athy yesterday afternoon to watch its opportunity of striking the enemy in flank. The officer commanding the Rathangan column has been instructed to send a battery of horse artillery and a squadron of cavalry to your assistance, which are due to reach the Callachknock road at 9.20 A.M.

3. The General wishes you to attack the enemy's rear guard vigorously before it can quit the Curragh; he leaves to your discretion whether to pursue it, or to intercept, and, if possible, drive it in a northerly direction across the River Liffey. In any case he confidently expects you to be in possession of the eastern exits from the Curragh by 12 noon.

SPECIAL IDEA (Invading Force).

From General Officer Commanding, Dunlavin.

To Officer Commanding Rear Guard, Old Kilcullen.

DUNLAVIN,

9 P.M., *14th September*, 1893.

1. Dispose your troops to-morrow morning so as to resist any hostile attack against the Donnelly's Hollow defile, with the flag-staff, Observatory Hill, as a first line.

2. A battery of horse artillery and a squadron of cavalry to co-operate with you, will await your orders at Fields' Hotel, at 9.30 A.M.

3. Communicate frequently to me through the Don Aillane Signal Station, and should you be forced to retire, your line will be Old Kilcullen—Gormanstown Ho.—Grangeby Ho.—Dunlavin.

Area of Operations (refer to Map).

Lines drawn E. and W. through Camp Inn Hill, and N. and S. through Kildare and Kilcullen.

Southern boundary, Tully North—Tully East—Demesne and Old Kilcullen Roads (inclusive).

At 10 A.M., after operations had commenced about half an hour, a second special idea was delivered by a Staff officer to the commander of the vanguard.

SPECIAL IDEA (Invading Force).

At 10 A.M., the officer commanding the rear guard is handed the following despatch from the General Officer Commanding, Dunlavin :—

DUNLAVIN,

9 A.M., *15th September*, 1893.

Your line of retreat is threatened by a force of cavalry, which was seen in the neighbourhood of Ardscull Moat at 7.30 this morning. I do not therefore wish you to commit yourself to any serious engagement in the vicinity of Donnelly's Hollow

defile, which would compromise or delay the complete withdrawal of your force from the Curragh by 12.30 P.M.

You cannot with safety hold the eastern exits longer, but up to that hour I expect you to check the enemy's advance at every favourable opportunity.

There is not much to record in connection with the operations upon this day. The commander of the defending force made an impossible attack, two battalions traversing an almost featureless plain under artillery and rifle fire from a commanding height at medium ranges, which course of action is not easy to understand, as a turning movement could have been attempted along a parallel road well screened from the rearguard position!

After the receipt of the second despatch from the G.O.C., Dunlavin, there is no doubt the rearguard commander delayed his retirement too long, and also failed to cover effectually by fire this withdrawal of his troops.

The chief umpire ruled that the defending force had successfully gained the eastern exits from the Curragh by the time named; but it was a doubtful day, and a disregard of the rules for field manœuvres was shown by both forces, more particularly on the part of the invading force.

The cease fire sounded at 12.55 P.M.

16th September.

GENERAL IDEA.

An invading force, marching in a north-westerly direction, has reached Hollywood; while a defending force is in the neighbourhood of Clonbulloge.

SPECIAL IDEA (Invading Force).

From General Officer Commanding, Hollywood.
To Officer Commanding Advanced Guard, Kilcullen.

HOLLYWOOD,
5.30 A.M., *16th September*, 1893.

1. A hostile patrol was seen last evening on the Grand Canal, near Wilson's Bridge, and it is reported that Rathangan is occupied by cavalry and a strong body of infantry.

2. Endeavour to anticipate the enemy in seizing the Duneany Hills; but if, as I expect, he has forestalled you, I wish you to do your utmost to dislodge him, and suggest for your consideration a demonstration from the direction of Erindale, while making your main attack on his left flank.

3. Leave a signal station on the Freeth's Hills, and send all messages for me to that station.

SPECIAL IDEA (Defending Force).

At 8 A.M., on the 16th September, the officer commanding the advanced guard at Rathangan receives the following order from the General Officer commanding the division at Clonbulloge.

CLONBULLOGE,
7 A.M., *16th September*, 1893.

1. Place outposts forthwith guarding the approaches to Rathangan, with a line of observation on the hills which run N.E. and S.W. of the Chair of Kildare.

2. I am expecting a sufficient reinforcement to enable me to take the offensive, and wish you to hold the line indicated at all hazards, and, if you see a favourable opportunity, to endeavour to drive the enemy south of the G.S. and W. Railway.

Area of Operations (refer to Map).

The parallelogram formed by lines running south and east from Rathangan, and north and west from Athgarvan.

This day's operations proved more interesting and instructive than the two preceding ones; the country was fresh to both sides, which had not been the case previously, the ground naturally being new to the Dublin field column.

It would seem that sufficient time had not been allowed to the commander of the defending force to place his outposts before the actual infantry collision occurred. Still, he can hardly have been well served by his cavalry, as he remained in complete ignorance of the whereabouts and dispositions of the bulk (the infantry) of the enemy's force, which resulted in the occupation of Grange Hill by two of its battalions.

It may perhaps be of interest to note the movements of the invading force.

The disposition was, briefly, as follows:—

1 battalion to occupy defender's attention on W. side towards Chair of Kildare, whilst remainder of force worked round by Milltown, and effected a lodgment on E. end of the range by Newington Ho and Grange Hill; this was successfully carried out, and Grange Hill was in possession of the invaders by 11.40 A.M. The battalion to which was entrusted the difficult task of engaging the defender's attention on the W. end of the range of hills performed its task remarkably well, and was ably handled, succeeding in keeping the defenders engaged in that direction, whilst the remainder of the force occupied Grange Hill. This occupation would not have been so easy if the battalion entrusted with the left section of the defence had fallen back on Grange Hill when confronted with such a strong force; as it was it retired towards Feighcullen, where it was kept engaged by 2 companies of the invader's infantry, the remainder making good their position on Grange Hill.

The defender's cavalry was well handled in doing its utmost to delay the advance of the attacking column.

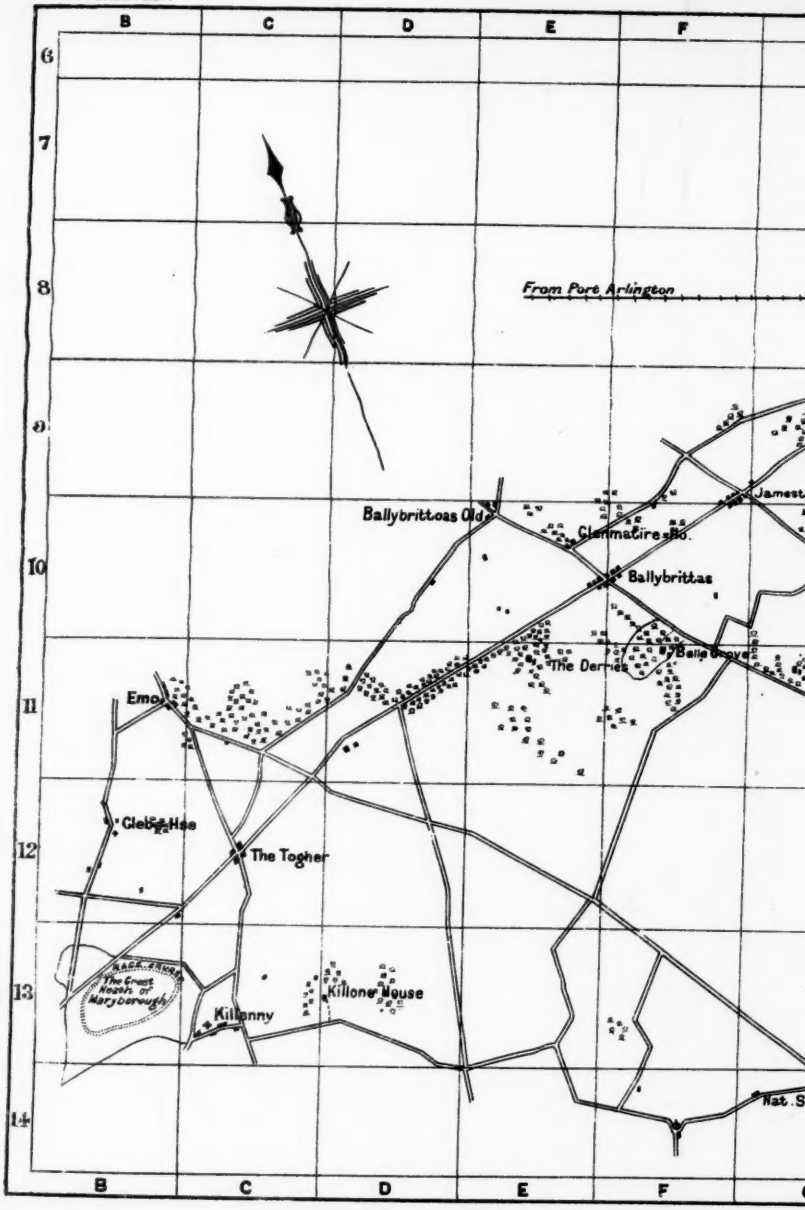
The cease fire sounded at 12.10 P.M., when the range of hills were practically in possession of the invaders.

This concluded the second series of manœuvres of which this brief sketch has been given, the first series having been noted in detail.

The Dublin field column left the Curragh on 10th September, a General and Special Idea being published, which described it as a field column retiring on Dublin, pursued by cavalry, artillery, and infantry.

The total cost of this series was only 160*l.* (the Dublin column having been a week under canvas), and it must be admitted on all hands the experience and mutual benefit of a practical and instructive nature gained from these military exercises over varied ground was well worth the money.

It is hoped that these notes may to some extent explain the practical work which is being carried on in Ireland.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From Port Arlington
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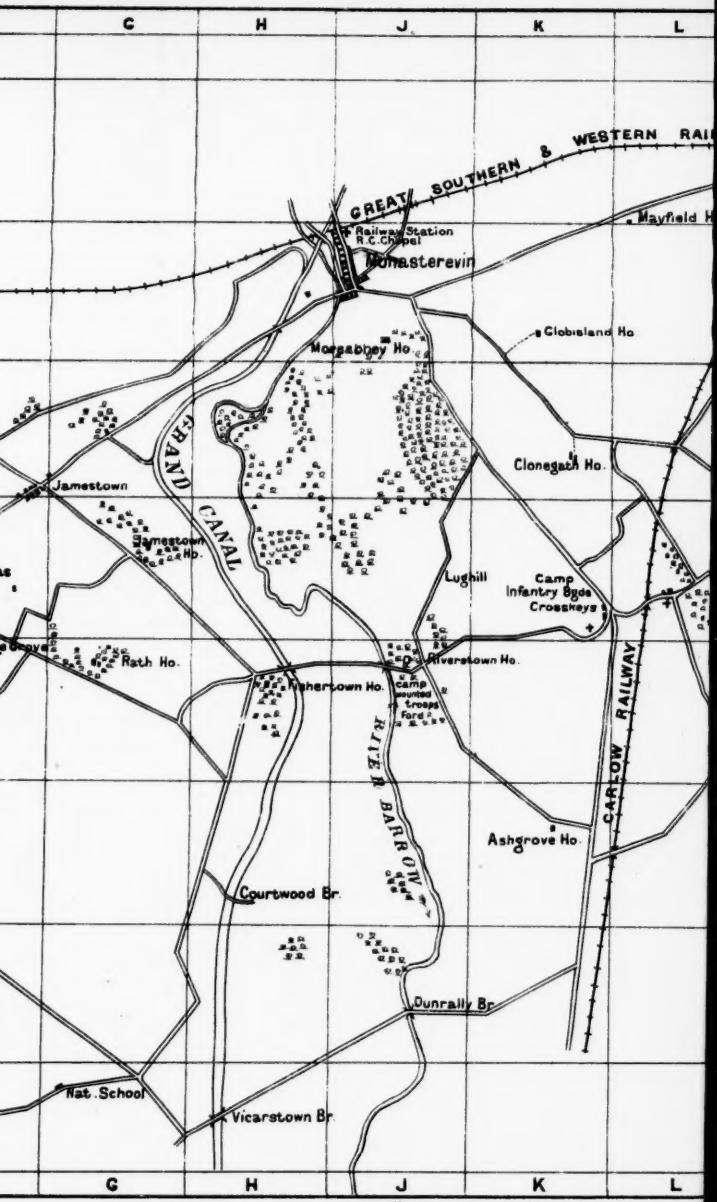
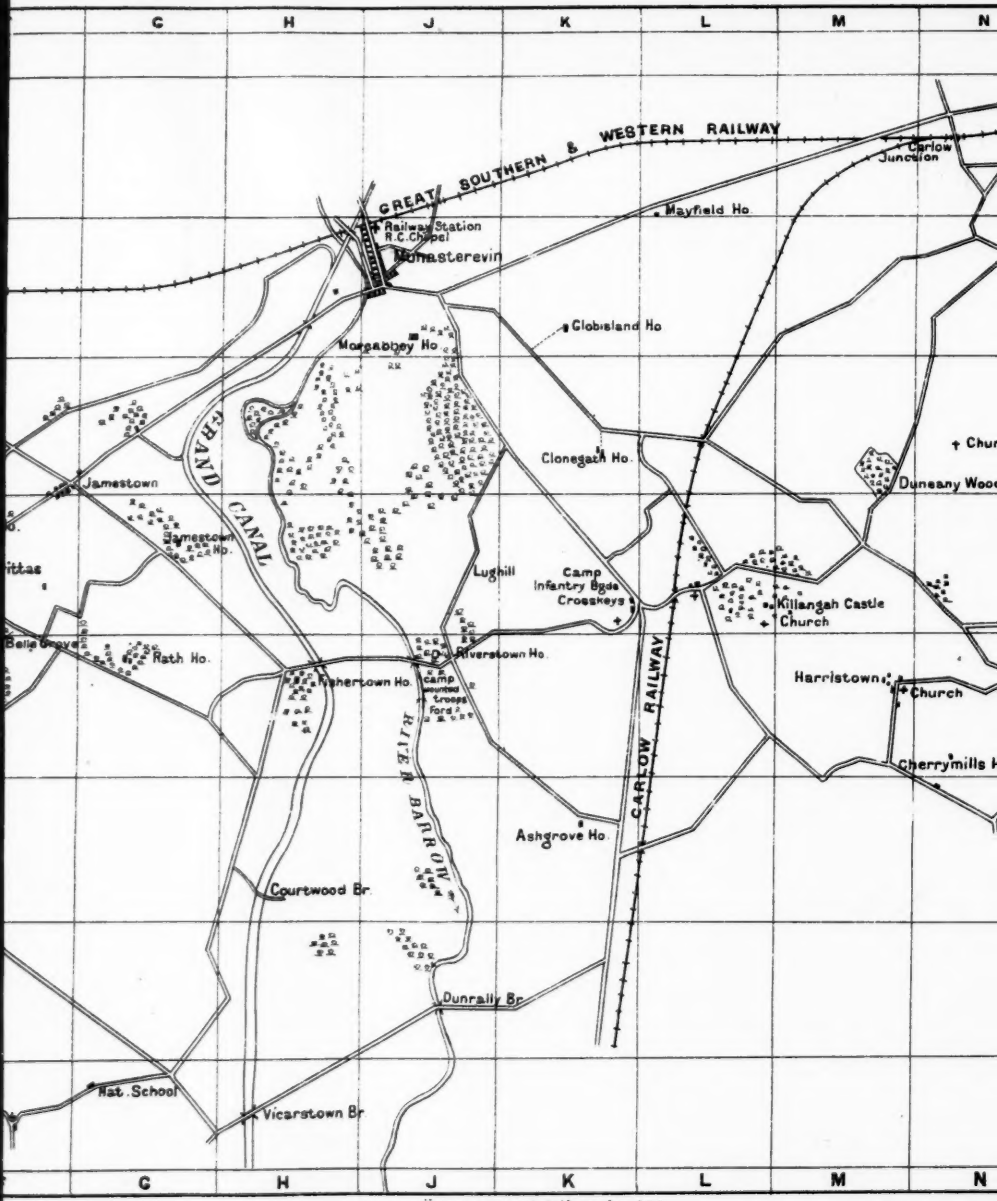
Ballybrittas
The Derries
Emo
Clelland Hse
The Togher
The Great Heath of Maryborough
Killonny
Killoney House

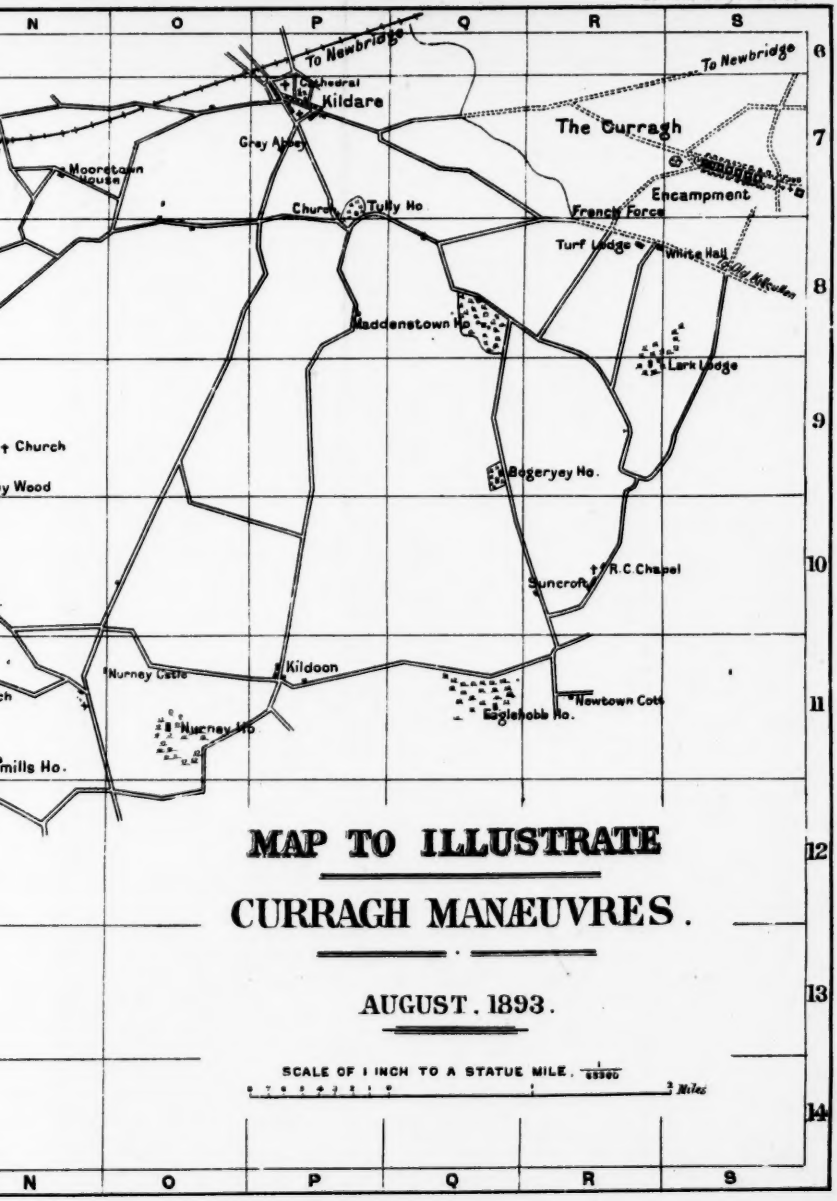


Harrison & Sons, Lith., 59 Martins Lane, W.C.



Harrison & Sons, Ltd., 5 Martins Lane, W.C.

To face page 444.



MAP TO ILLUSTRATE

CURRAGH MANÆUVRES.

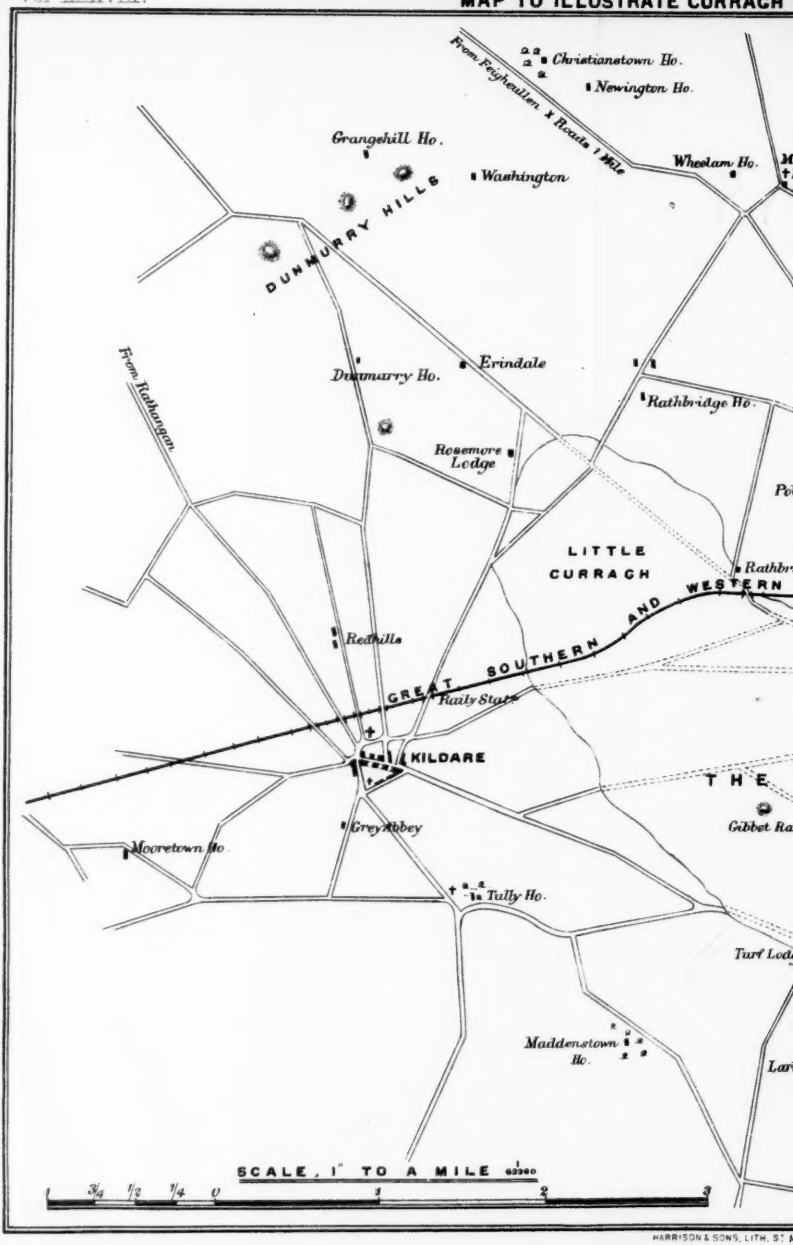
AUGUST. 1893.

SCALE OF 1 INCH TO A STATUE MILE. 1/63360

0 1 2 3 4 5 6 7 8 9 1 0 1 2 3 Miles

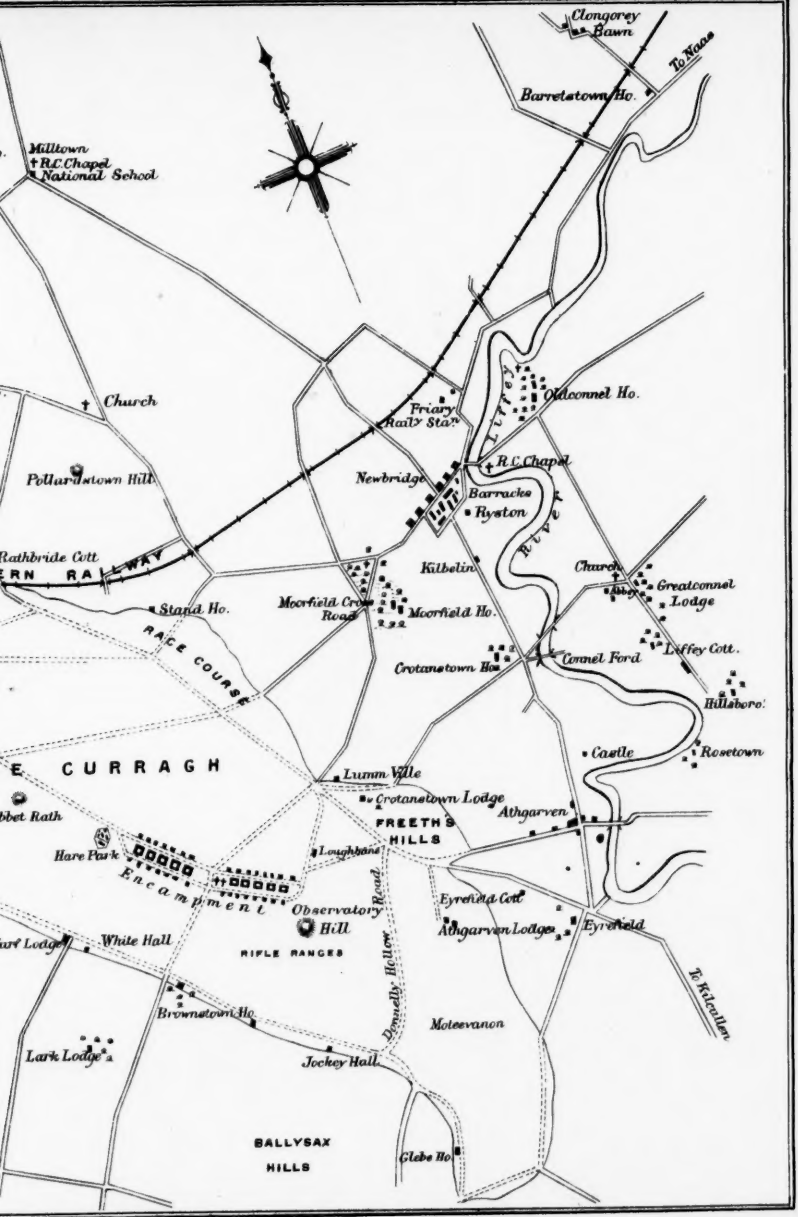
Journal R.U.S.Institution
Vol XXXVIII.

MAP TO ILLUSTRATE CURRAGH



HARRISON & SONS, LITH. ST

GH MANÆUVRES SEPTEMBER 1893.



LITH. ST MARTINS LANE W.C.

ARMOUR-PLATE TRIALS AT POLA, AUSTRIA.

In the December Naval Notes we mentioned that some important armour-plate trials had just been carried out at Pola, to determine the armour to be employed for the three new battle-ships under construction for the Imperial navy. We are indebted to the editor of the "Mittheilungen aus dem Gebiete des Seewesens" for the following full description of the trials and the accompanying plates, taken from photographs, of the effect of the firing on each of the specimen plates submitted to the test.

The competing firms were Messrs. Vickers and Messrs. Cammel, from England, Messrs. Krupp, and the Rhenish Dillingen Co., from Germany, and the Austrian firm of Witkowitz and Co., who three years ago were successful in obtaining the contract for the armour for the ram cruiser "Kaiserin und Königin Maria Theresa," after a prolonged trial, in which they competed with the already well-known firms of Krupp and Vickers for the contract.

The dimensions of the competing plates were fixed at 7 ft. × 6 ft. × 10·8 in., and they were secured by six 4·3-in. bolts to a 20-in. wood backing. Messrs. Vickers, Cammel, and Witkowitz sent homogeneous nickel-steel plates, and the first-named firm, in addition, also sent a Harveyized-carbon steel plate, while the plate from Messrs. Krupp was of Harveyized nickel-steel. Each plate was subjected to five shots, one at each corner, from a 6-in. gun, with a projectile weighing 113 lbs., and a charge of 39 lbs. of prismatic, giving an initial velocity of 631 m., and a corresponding energy of 1035·49 m.t.; while the fifth shot was fired at the centre from a 24-cm. (9·5-in.) gun, the projectile weighing 470 lbs., and the charge, 99 lbs., giving an initial velocity of 432 m., and a total energy of 2046·08 m.t.

The first plate tested was the homogeneous nickel-steel plate of the Dillingen firm. The first projectile (Streiteben shell) penetrated the plate at the upper corner, and remained uninjured with the point projecting 150 mm. beyond the rear surface of plate; at the point of impact the edges of the orifice were crushed outwards 35 mm., while through a diameter of about 435 mm. the rear surface of plate was broken and bulged out some 65 mm. The second projectile (Krupp shell) went clean through the plate and backing, and only a broken fragment of it was afterwards found in rear of the target. The edges at point of impact were crushed outwards 45 mm., and in rear the plate through a diameter of 435 mm. was broken and bulged outwards 110 mm. The third projectile (Streiteben) penetrated 220 mm. into plate and then broke up, the point remained embedded in plate, the remaining pieces being driven backwards out in front of target. The front surface of plate showed at point of impact an out-

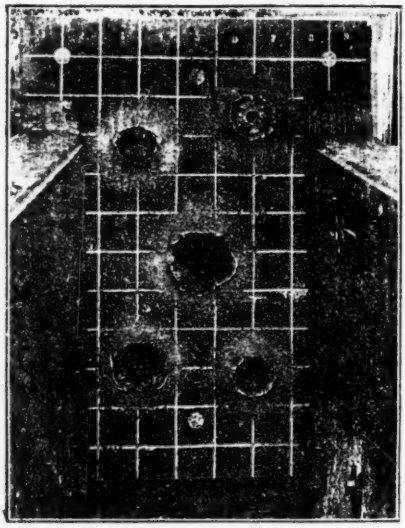
ward crushing of 45 mm., and in rear three short cracks, 70, 100, and 200 mm. long; the bulging out of plate in rear was only 10 mm. The fourth projectile (Krupp) produced the same results as the previous one, the point penetrating about 180 mm., and the shot then breaking up. The fifth projectile (Krupp) from the 24-cm. gun went through plate and backing, and remained in rear of butt; its ogival head showed three fine cracks. The back of the plate was broken and bulged out, through a 620 mm. diameter, 160 mm., the face 70 mm., and the shock caused the head of No. 4 projectile to fall out. When the plate was removed it was found that the two lower and two centre bolts were broken off.

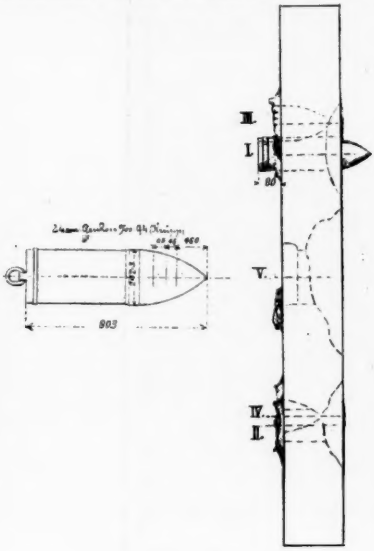
The second trial was that of the Vickers homogeneous nickel-steel plate. The first projectile (Streiteben) penetrated plate and backing 690 mm., and remained. The edges of plate at point of impact were crushed outwards some 45 mm.; at the back the plate was broken and jagged out 200 mm., and showed five surface cracks, while the point of projectile projected in rear about 420 mm. The second shot (Krupp) penetrated 360 mm., remaining uninjured; the edges of plate at point of impact crushed out 40 mm., while the back was broken and bulged 100 mm. with three surface cracks. The third shot (Streiteben) went through plate and backing, the edges at point of impact crushed out 40 mm., and in rear plate broke and bulged out 180 mm., and showing, in addition, four surface cracks. The effect of the fourth shot (Krupp) was almost precisely similar, but there were six cracks visible in rear. The projectile (Streiteben) from the 24-cm. gun went clean through plate and backing and into butt. The face of plate at impact crushed out 90 mm., and the back through a diameter of 680 mm. broken and bulged out 150 mm., but when plate was removed, all the bolts were found intact.

The Krupp Harveyized nickel-steel plate was next tested. The first projectile (Streiteben) shattered to fragments on impact, the point penetrating 70 mm., and remaining flattened out; the face of plate showed a deep funnel-shaped fracture 70 mm. with a diameter of 380 mm.; in the neighbourhood of point of impact exfoliations of the upper strongly carbonized surface showed themselves; the back of plate was uninjured. The effect of the second shot (Krupp) was much the same, the exfoliations being 12 to 15 mm. deep, while the back of plate was bulged 15 mm. The third projectile (Streiteben), after penetrating 300 mm., rebounded and remained intact a few paces to the right of target. The plate was somewhat opened at point of impact, and showed, moreover, three fractures, two of which went right through the plate, and extended as far as the outer edge; the third was neither so deep nor extended so far. The breadth of fractures was 3 to 8 mm., and in the upper one a flaw in the metal reaching from point of impact to edge of plate was discovered; on the face, exfoliations of the carbonized surface were plainly visible; the back of the plate displayed, besides the two fractures, two other surface cracks, and was bulged out some 80 mm. At this shot the head of the first projectile fell out. The fourth shot (Krupp shell) penetrated plate 320 mm., and then rebounded uninjured 40 paces in

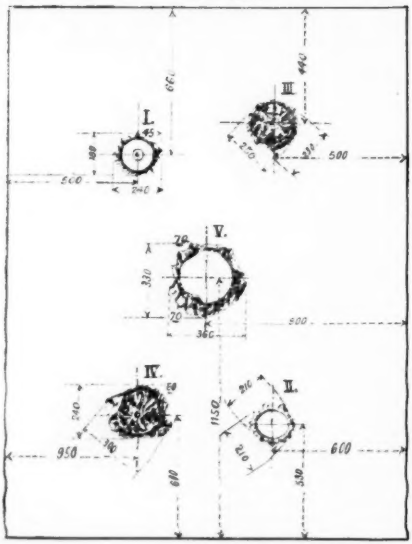
FIG. 1.

PLATE No. 136. DILLINGEN & Co. DIMENSIONS, 7 FT. X 6 FT. X 10.8 INS.

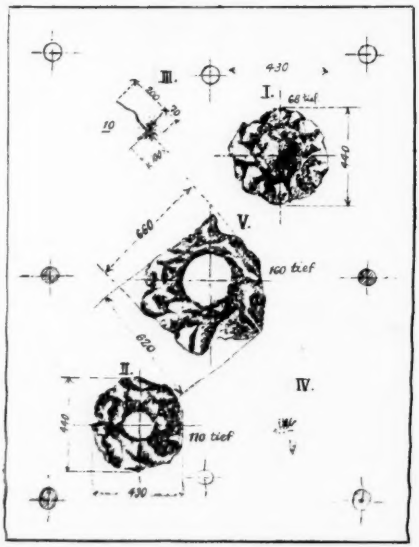




FRONT VIEW.



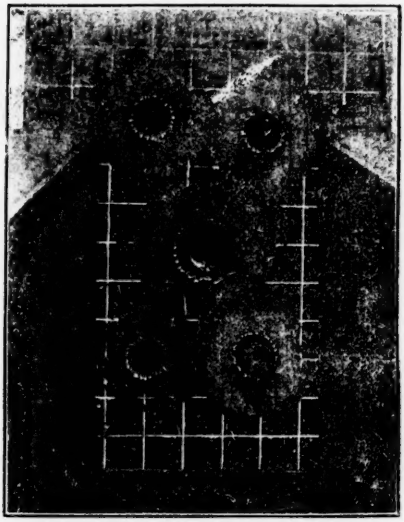
REAR VIEW.

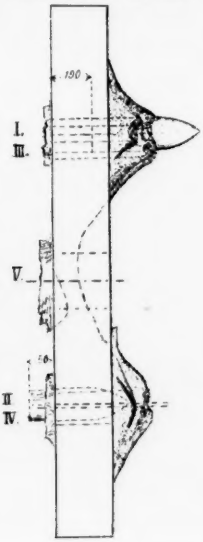


Remarks—The

FIG. 2.

PLATE No. 514/11. VICKERS & Co. DIMENSIONS, 7 FT. X 6 FT. X 10.8 INS.



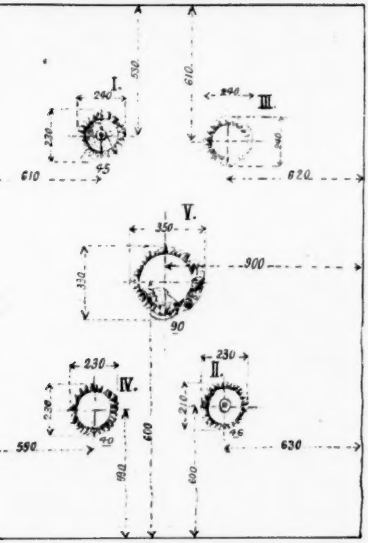


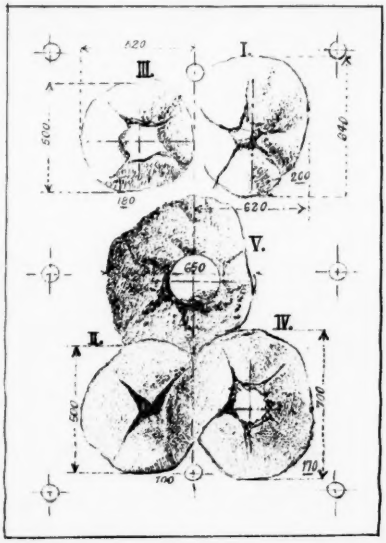
FRONT VIEW.

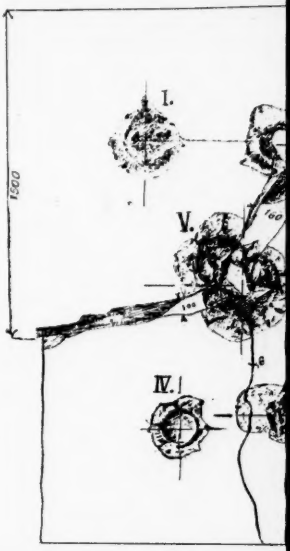
REAR VIEW.

PLATE No. 33

FRONT VIEW







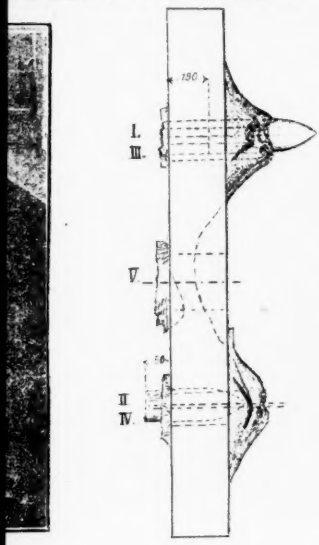
-The lines measured round the point of impact denote the bulging out and crushing up of edges in m.m.

Harrison & Sons. Lith. St. Martins Lane W.C.

. 2.

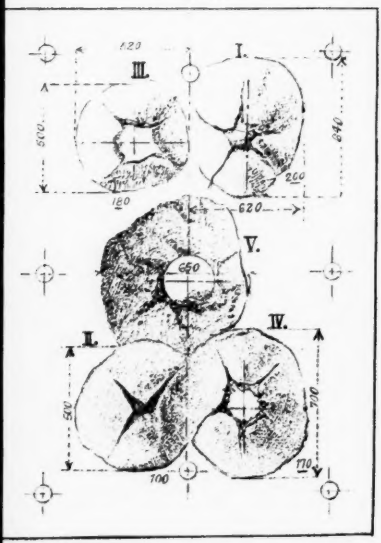
DIMENSIONS, 7 FT. × 6 FT. × 10.8 INS.

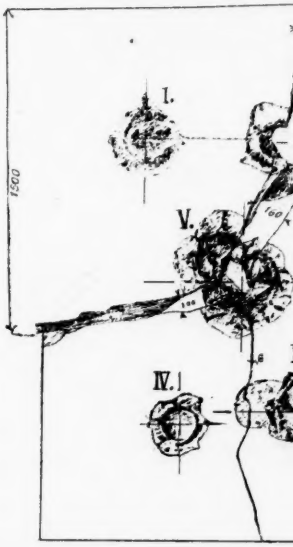
PLATE No. 334.



REAR VIEW.

FRONT VIEW



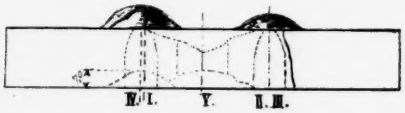


enote the bulging out and crushing up of edges in m.m.

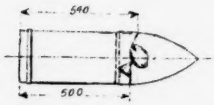
St Martins Lane W.C.

FIG. 3.

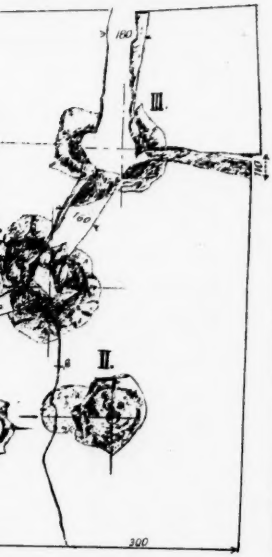
PLATE No. 334. KRUPP & Co. DIMENSIONS, 7 FT. x 6 FT. x 10.8 INS.



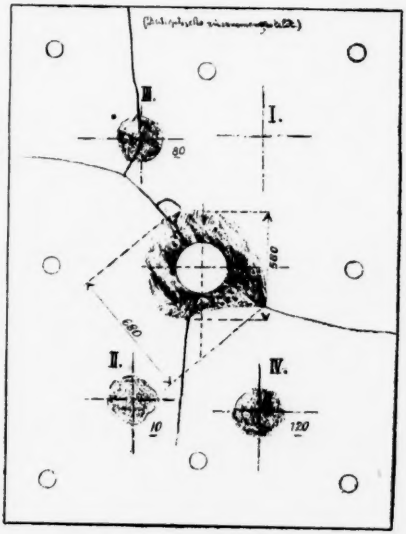
24 C.M. PROJECTILE, KRUPP No. 272/40.



FRONT VIEW



REAR VIEW.



front of target. The plate showed surface exfoliations, and the back was bulged out 120 mm. with four surface cracks. At the fifth round fired from the 24-cm. gun the projectile (Krupp) penetrated through plate and backing, and was found broken into two fragments 20 paces in rear of target. The two large fractures in plate were further opened out to 110 and 180 mm. wide, so that the right upper portion of the plate was completely broken off; moreover, two new fractures right through the plate showed themselves at the point of impact, one of which on the right extended to orifice made by No. 3 projectile, while the other extended to the outer edge, so that the left upper portion was also completely detached. A third fracture right through plate extended nearly to bottom from the centre, while a slight surface crack was visible between V and III points of impact. Of the eight securing bolts, only the upper right hand and centre one were broken.

The next trial was made with the Harveyized carbon-steel plate of Messrs. Vickers. The first projectile (Streiteben) broke, the head remaining embedded about 250 mm.; the plate showed on its face several surface cracks running from point of impact, with a crushing out of edges of 40 mm.; the back of plate was bulged about 50 mm. The second shot (Krupp shell) remained embedded uninjured, having penetrated 320 mm. through plate and backing, the head projecting 50 mm. beyond rear face of plate, the edges of which were crushed out 50 mm., while the face showed, stretching from the point of impact, several short surface cracks and the usual crushing up of edge of plate round orifice of 40 mm. The third shot (Streiteben) produced similar results, the projectile penetrating through plate and backing 430 mm. and remaining embedded. The face of plate showed several short surface cracks and the customary bulging out of plate at orifice of 40 mm., and 120 mm. in rear. The fourth shot (Krupp) remained uninjured in plate, after penetrating 280 mm. The face showed some short surface cracks, while the back of plate was bulged some 50 mm. The 24-cm. Streiteben shell broke up on impact, the point penetrating 320 mm., and remaining embedded. The plate showed three fractures, running from point of impact nearly to the edge. One fracture through plate between centre to point of impact III. and, extending from there to upper edge, was 1 mm. wide on the surface and 10 mm. at the back; the second, running nearly horizontally from centre to edge, was 3 mm. in breadth, while the third, running towards the left bottom edge, was 10 mm. broad in face and rear; in addition the back of plate showed several 200 mm. long surface cracks, radiating from point of impact. The securing bolts were neither broken nor bent.

The next trial was of the homogeneous nickel-steel plate of the Austrian firm of Witkowitz. The first shot (Streiteben) broke to pieces on impact, the head penetrating 100 mm., and remaining flattened out. The face of plate showed the edges crushed up 35 mm. round the 100 mm. deep funnel-shaped orifice at point of impact, of 230 to 300 mm. in diameter. The back of plate showed no signs of injury. The second shot (Krupp) remained intact, and rebounded

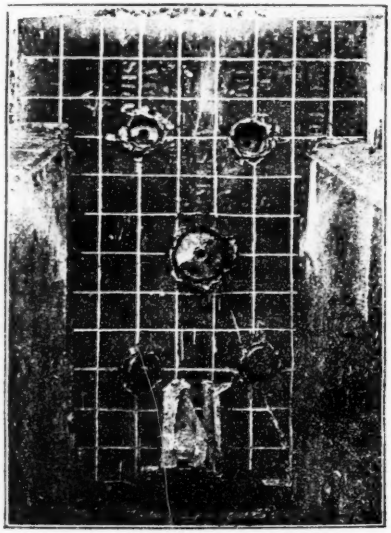
24 paces in front of target, having previously penetrated 340 mm.; the back of plate was bulged out 60 mm., and showed four radial surface cracks. The third projectile (Streiteben) shattered on impact, the point penetrating 110 mm. The plate in front showed a funnel-shaped orifice about 300 mm. in diameter, the rear surface showed no signs of injury. The fourth shot (Krupp shell) broke up, the point remaining in plate, the penetration could not be accurately measured, the edges of plate at impact were crushed up 45 mm., while in rear the plate was bulged to about the same extent with five radial surface cracks. The 24-cm. projectile (Streiteben steel shell) broke up on impact, the head after penetrating 90 mm. rebounded in front of target, flattened out. A funnel-shaped orifice of 320 mm. diameter and 90 mm. deep was made in face of plate, while the back was bulged out some 10 mm. The securing bolts were neither broken nor bent.

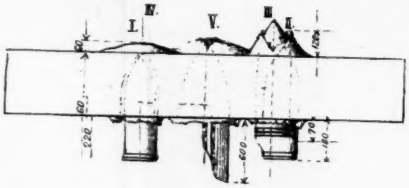
The final trial was made with the Cammel nickel-steel plate. The first Streiteben shell penetrated plate and backing 500 mm., and remained embedded uninjured. The edges of plate round point of impact were crushed out 40 mm., while in rear they were jagged and bulged out 140 mm., and there were several radial surface cracks. The point of projectile protruded 230 mm. beyond rear surface of plate. The second projectile (Krupp) went clean through plate and backing, and could not be found. At point of impact edges of plate crushed up 60 mm., and in rear jagged and bulged 100 mm. The third projectile (Streiteben shell) penetrated 230 mm. and then broke, the point remaining embedded; the back of plate was bulged 40 mm. The fourth shot (Krupp shell) broke, the point remaining in plate, having penetrated 430 mm. into backing. The surface edges at point of impact were crushed up 40 mm., and in rear jagged and bulged 130 mm. with six radial surface cracks. The 24-cm. Streiteben shell penetrated 300 mm. and then broke, the point remaining embedded. The plate showed three fractures right through: the first stretched from point of impact V to I, and then to upper edge with a maximum width of 11 mm. on the face and 15 mm. in rear. The second fracture passed through III to upper edge, and was 30 mm. wide in front and 40 mm. in rear; while the third, passing through II to lower edge, was 66 mm. in front and 56 mm. in rear. The plate also showed on rear-face a crack 1 to 33 mm. wide from V through IV to lower edge. Of the eight bolts, five, the four corner and right centre, were bent.

The result of the trials was an undoubted success for the Austrian firm, to whom the contract for the armour for the new ships has now been given; and the Vickers firm have the satisfaction of knowing that their Harveyized carbon-steel plate came out a good second, and proved to be much superior to the plates of the three other competing firms. On the other hand, it is not flattering to our steel trade, that twice running a new firm like the Austrian firm, and in what is quite a new industry in Austria, should have put plates in the field which have proved superior to the best that our great Sheffield firms can apparently produce.—H. G.

FIG. 4.

PLATE No. 515/1. VICKERS & Co, DIMENSIONS, 7 FT. × 6 FT. × 10.8 INS.

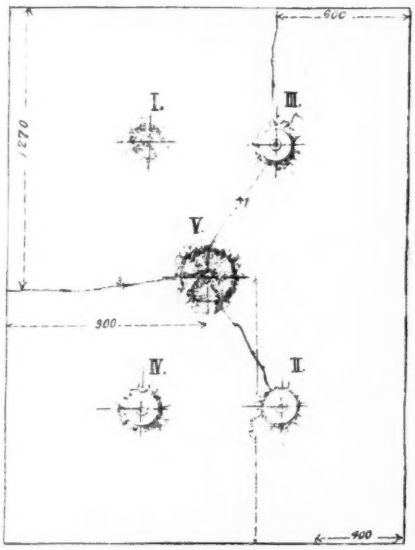


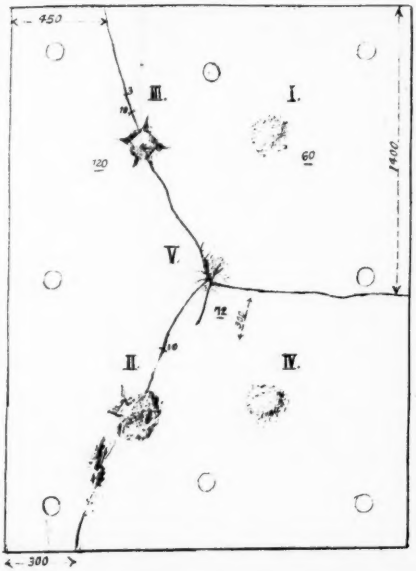


24 C.M. PROJECTILE, 10 A/5 STREITEBEN.

FRONT VIEW.

REAR VIEW.

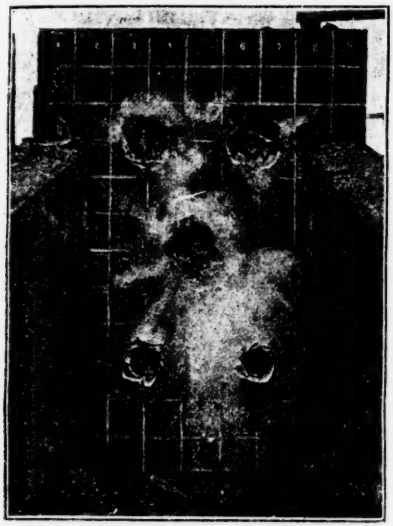




Remar

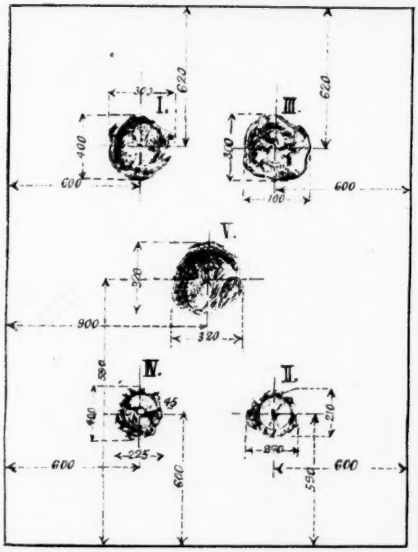
FIG. 5.

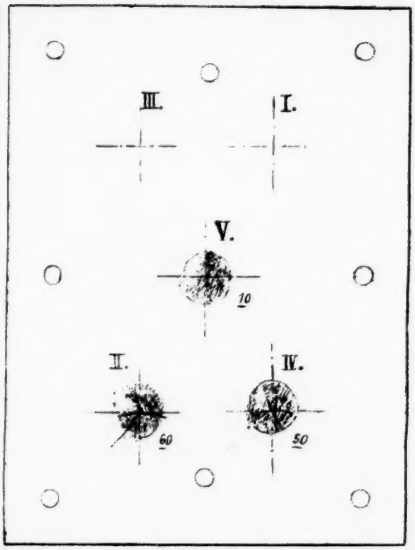
PLATE No. 9403. WITKOWITZ & Co. DIMENSIONS, 7 FT. X 9 FT. X 10.8 INS.



FRONT VIEW.

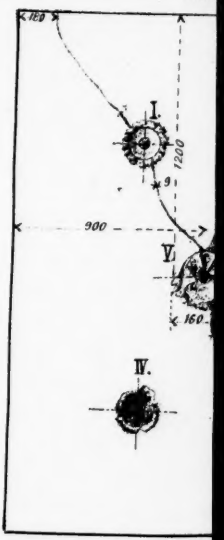
REAR VIEW.





PLATE

FRONT

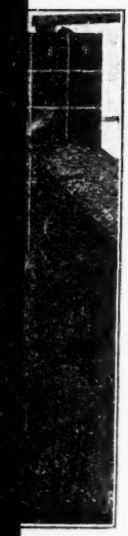


Remarks—The lines measured round the point of impact denote the bulging out and crushing up of edges in m.m.

Harrison & Sons, Lith. St Martins Lane W.C.

IG. 5.

DIMENSIONS, 7 FT. X 9 FT. X 10.8 INS.



REAR VIEW.

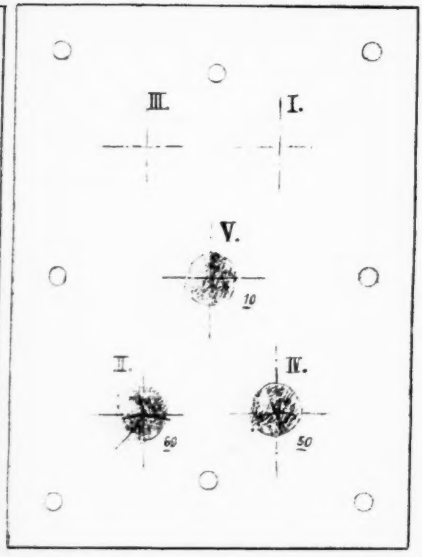
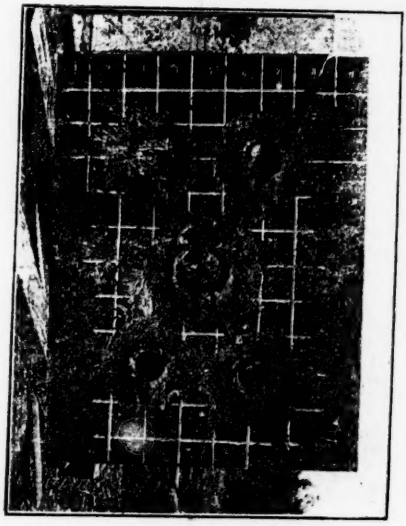
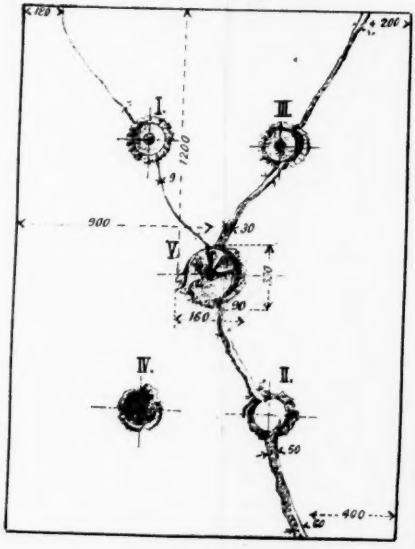


FIG.

PLATE No. 6730. CAMMEL & Co. D



FRONT VIEW.



act denote the bulging out and crushing up of edges in m.m.

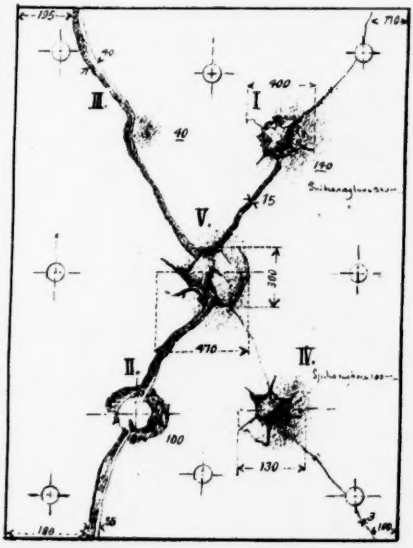
St. Martins Lane W.C.

FIG. 6.

IEL & Co. DIMENSIONS, 7 FT. x 6 FT. x 10.8 INS.

POINT EMBEDDED, CYLINDRICAL PORTION
BROKEN INTO SEVERAL PIECES.

REAR VIEW.



THE INVASION OF FRANCE.

(Reprinted from the "Times" by special permission.)

One of the most remarkable, interesting, and curious Parliamentary documents ever prepared in France is the *proposition de loi*, having for its purpose to transfer to the control of the Minister of Marine the coast defences of the Cotentin and of Corsica, which M. Cabart-Danneville recently presented to the Chamber of Deputies. Less exhaustive in its proposals than the general programme of M. Lockroy, this document serves to concentrate attention upon what is, in effect, a real weakness of France. It is remarkable as being the first French public State paper in which the eventuality of a war with England has been dealt with openly; it is interesting because, though bearing upon its face the names of MM. Cabart-Danneville and de Mahy, of Admiral Vallon, General Riu, Colonel Guérin, and 43 other Deputies, it is known to be mainly inspired by Vice-Admiral Cavelier de Cuverville, Naval Prefect at Cherbourg, who, according to M. Lockroy, proposed some months ago to resign his office rather than be responsible for the existing state of things; and it is curious as embodying a view of the manner in which French sailors, soldiers, and statesmen expect Englishmen to invade their country. Englishmen are certainly very unlikely to attempt a hostile landing beyond the Channel, but there are facts so interesting, and opinions so remarkable, in this document that they must not go unrecorded. It may be well to recall the fact that, by the decree of May 13, 1890, the French coast defences were confided, under conditions, to the dual control of the naval and military departments. This is an arrangement that has never given satisfaction, and French naval officers have not ceased to insist upon the evils to which it may give rise. M. Cabart-Danneville and his colleagues are content, however, to advocate the transfer to the sole control of the marine of the defences of the Cotentin and Corsica, places which they describe as capable of being converted into a new Gibraltar and a new Malta by a successful invader.

The Cotentin peninsula, to which they have chiefly devoted their attention, is situated to the north of a line drawn from the Baie des Veys to Port Bail. On the east and west the coast presents certain flat beaches, as at Surtainville, Rozel, Vauville, and Quinéville, while in the midst of the more rocky northern shore is cleft that deep bay at the head of which lie the naval port and docks of Cherbourg. To the south the peninsula is divided from the Continent by two waterways. One of these, the river Douve, which flows into the Baie des Veys, is of some importance, while the other, the Ollonde, is a simple brook, which has its mouth at Port Bail on the west. From Saint Sauveur le Vicomte to the sea the Douve constitutes a defensive

line, which might be strengthened by inundating the marshy plain through which the river flows, thereby creating a sheet of water which would extend beyond Saint Sauveur de Pierrepont. To the southward the country is absolutely flat, where the Vire and the Aure have their lower courses, so that an invader occupying the heights of Saint Côme du Mont, Pont l'Abbé Picauville, and Saint Sauveur le Vicomte would be in a commanding position against an enemy advancing northward. The line of the Ollonde is less strong, but is covered by the hills on its right bank, which extend from Saint Lô d'Ourville to the sea. The weakest point in this chain of defences is the band of territory, about 6½ kiloms. wide, between the angle of the Ollonde at Saint Lô and Saint Sauveur de Pierrepont, where is the extremity of the lower country capable of being inundated. The defensive zone thus lying across the isthmus of Port Bail is known under the name of the "lines of Carentan." Intrenched behind these, say M. Cabart-Danneville and his colleagues, an enemy would take Cherbourg in the rear, and would make the Cotentin a base for ravaging operations in Normandy and the Ile de France, and would thence be able to threaten the capital and to place the army engaged with an enemy on the east in a very critical situation.

The Deputies, having thus indicated the advantages which a footing in the Cotentin would give to an enemy, proceed to show how he might effect a landing there. This is the most interesting part of their exposition. Admitting that the rocky character of the port of Barfleur and Réville Bay would render these somewhat dangerous, while the neighbourhood of the works of Tatihou and La Hougue might be an inconvenience at Saint Vaast, they indicate the long sandy shore between La Hougue and the Baie des Veys as suitable for a disembarkation, since it answers the conditions of easy access and comparatively safe anchorage near to the shore. If the position of Quinéville should be rendered unsafe by the fire from La Hougue, the disembarkation might be confined to the section between Madeleine and Bourg Saint Marcouf, which is about 6½ kiloms. long, and is perfectly safe since the fort on the Ile Saint Marcouf has been dismantled. On the western side of the peninsula the long bay of Vauville might, at first sight, seem well adapted for a landing, but the fact that the ground rises rapidly from the shore is a disadvantage. Therefore the Bay of Sciotat, to the north of the Pointe de Rozel, might be chosen in preference, and, if its 3 kiloms. of length should prove insufficient, the more accessible southern part of the bay of Vauville might also be used. Again, further southward on this coast is the bay of Surtainville, extending from the village of that name to the rocks of Le Rit, with the village of Baubigny as a central point. Here, say the Deputies, is a beach 7 kiloms. long, admirably suitable for a landing place. In effect General Mercier has admitted the danger, but contends that a fort, which is about to be begun at Port Bail, will sufficiently protect the peninsula.

Having demonstrated the accessibility of the Cotentin as they conceive it, the Deputies endeavour to show historically that England has always attached very great importance to that region. The

history is respectable, but not above reproach, for it certainly is not the fact that, when Englishmen have invaded what is now France, they have invariably done so by way of the Cotentin, and there were sufficient reasons, surely, other than strategical ones, that led them to Normandy. The dealings of Vauban and his contemporaries with this region were curious. The fleet left by Colbert needed a shelter, and he was called upon to make good the defences of Cherbourg. These were pushed forward actively, but, upon the outbreak of hostilities, they were destroyed lest they should fall into the hands of the English. Again they were created, but, in 1758, "thanks to the treason or incapacity of the Comte de Rémond," we succeeded in retarding the completion of them for half a century.

"Thus the English have never failed to disembark in the Cotentin, to destroy the works of Cherbourg when they could, and to make the peninsula the base of their operations against us. Are not the strategical considerations which have moved them the same to-day? Exactly. Their *vieille rancune* against France cannot but incite them to join the Triple Alliance, and would not the very hope of being able to seize the Cotentin, to make of Cherbourg a new Gibraltar, and thus to become absolute masters of what they call the British (*sic*) Channel, be enough to urge them forward if they saw us embarrassed on the eastern or south-eastern frontier? And may not Germany herself have this idea, profiting by the benevolent neutrality of England, or drawing her in her train?"

We can assure Frenchmen that such ideas as these are altogether foreign to Englishmen, who desire nothing so much as to be left alone. Their preoccupations on the Indian frontier, and the dangers they foresee upon the frontiers of Canada, are warning enough to them of the difficulties that may arise from close territorial proximity to a foreign State. It was a happy day for this country when the last of our soldiers turned his back upon the Continent, and since that time Englishmen have learned to cling tenaciously to their insularity. But the Deputies responsible for the *proposition de loi* have amassed and printed a great body of evidence tending to show that, from the times of Vauban to the present day, French sailors and politicians have held, and do now hold, us capable of aggressive action upon the Continent of Europe.

Those military officers who have long been proclaiming the insufficiency of our army for its duties will be surprised to find that, in the opinion of at least 48 French Deputies, we are in a position to disembark in the Cotentin peninsula, and that, too, with such celerity that no effective preparation could be made to meet us, an expeditionary corps of 60,000 men of all arms, with 5,000 horses, fully equipped, and with about 240 guns. With these, the Deputies suppose, would be allied a German force of half the strength. They show, to the best of their ability and in some detail, our means of mobilization and concentration, our facilities of transport, and so forth, and picture our flotilla arriving off the French coast on the morning of the 11th day—that of the Germans somewhat latter. They devote very little attention to the naval operations that must

precede this disembarkation, but we must suppose that they presume we shall have first established command of the sea, though upon this point they speak with no very certain sound. In regard to the actual method of disembarkation, M. Cabart-Danneville and his friends suppose that the convoys of transports would send torpedo-gunboats scouting inshore, and these making a feint of landing men, would draw the defenders from their shelter. Full information as to the whereabouts of the defending forces having been gained in this way, the landing would be effected under the fire of the fleet.

These are the main lines of the *proposition de loi*, which lays before the Chamber four articles—(1) The defence of the Cotentin and of Corsica to be confided solely to the navy; (2) the arsenal and town of Cherbourg to be connected with Caen by a railway line within six months; (3) strategic railways from Cherbourg to Beaumont-Hague and Barfleur, from Couville to Diélette, to be completed within two years; (4) a study to be forthwith made of the strategic railways of Corsica. When M. Cabart-Danneville and his colleagues write of the geographical and strategical situation of the Cotentin peninsula their *proposition* is very interesting, but when they deal with the conditions of an invasion they show that they have grasped the situation very imperfectly. It is odd to read in a Parliamentary paper the phrase, *Les Anglais sont jingoïstes comme on nous reproche d'être chauvins.* The gentlemen who contemplate an invasion of France by Englishmen can hardly be spared this last reproof.

NAVAL AND MILITARY NOTES.

NAVAL.

Home.—The following appointments have been made:—Captain A. B. Milne to "Trafalgar," as flag-captain to Rear-Admiral Domville; Captain Orford Churchill to "Dreadnought," vice Captain A. Moore, C.M.G.; Captain J. Hallifax to "Undaunted," which ship proceeds to China to relieve the "Leander"; Captain Hicks to "Melampus," the 1st Reserve ship at Kingstown, vice Captain Boardman, C.B.; and Captain Davis, C.M.G., to "Colossus," 1st Reserve ship at Holyhead, vice Captain Lloyd, promoted to Rear-Admiral.

The old gunboat "Banterer," tender to the "Aurora," 1st Reserve ship on the west coast of Ireland, has been paid off, and her crew turned over to the new 1st class gunboat "Jason"; similarly, the crew of the "Grappler," tender to the "Australia," in Southampton Water, have been turned over to the new 1st class gunboat "Leda."

The new 1st class gunboat "Hazard," which was launched at Pembroke on the 20th February, has arrived at Devonport, to be completed for sea, her engines and boilers having been placed on board before she left the slip. She is one of four of an improved type of torpedo-gunboat ordered under the Naval Defence Act, the other vessels being the "Harrier," "Halcyon," and "Dryad." They are 250 ft. in length, 30 ft. 6 in. beam, and, with a mean draught of 9 ft., have a displacement of 1,070 tons. They are fitted with two sets of triple expansion surface-condensing engines of the vertical inverted type, which are to be capable of developing 3,500 I.H.P. on a forced draught trial of three hours' duration, and 2,500 H.P. on an eight hours' natural draught trial, giving a speed of 19 and 17·5 knots respectively. The principal dimensions of the main engines are: cylinder, high pressure, 22in.; intermediate pressure, 34 in.; low, 51 in. diameter, with a stroke of 21 in. The propellers are three-bladed, and will make about 250 revolutions a minute. The boilers, four in number, are of the wet-bottomed locomotive type, each with two furnaces, and are to work at a pressure of 150 lbs. per square inch. The auxiliary machinery consists of 4 feed engines (2 main and 2 auxiliary), 2 fire and bilge engines, 2 sets of air compressing machinery, electric light engine and dynamo, 2 circulating engines, 2 drain tank do., capstan and steering engines, and 2 sets of Weir's evaporators and Kirkaldy's distillers combined, for feed water and drinking purposes. The armament will consist of two 4·7 Q.F. guns, and four 6-pr. Q.F. guns, 1 bow torpedo-tube, and 2 double-revolving broadside tubes. The "Sharpshooter" and the other first vessels of this type only cost 53,000*l.*, while the estimated cost of the "Hazard" and her sisters is 78,527*l.*

The new 1st class gunboat "Antelope" has completed her steam trials. As this vessel is one of the "Sharpshooter" class, and fitted with the wet-bottomed locomotive type of boilers, it was not anticipated that she would prove a success. Her trials, however, which were carried out under most unfavourable conditions as far as weather was concerned, were a surprise; on her eight hours' natural draught run, she attained a mean speed of over 17 knots in a heavy sea and fresh breeze, and exceeded the contract H.P. The results were: mean steam in boilers, 141 lbs.; vacuum, starboard 26 in., port 25·9 in.; revolutions, starboard 223·5, port 222·1; air pressure, ·55 in.; I.H.P., starboard 1,322, port 1,308, total 2,630; speed, 17·25 knots. Messrs. Yarrow and Co., of Poplar, the contractors for the machinery, guaranteed an I.H.P. of 2,500 with natural draught, and

this has been exceeded by 130. The forced draught trial was equally satisfactory, although carried out in a choppy sea. The results were: mean steam in boilers, 140 lbs.; vacuum, starboard 25·2 in., port 26 in.; revolutions, starboard 243·3, port 246·8; I.H.P., starboard 1,838, port 1,783, total 3,621; air pressure, 1·35 in.; speed by log, 19 knots. The engines worked throughout without a hitch, and, although less than one-half the air pressure allowed was used, the contracted H.P. (3,500) was considerably exceeded, and at one portion of the trial as much as 3,800 H.P. was obtained.

The 1st class gunboat "Sharpshooter," which has been fitted, at Devonport, with a set of Belleville tubulous boilers, has been undergoing some interesting trials in Keyham Basin with her machinery. The first was a 12 hours' trial to determine the coal consumption; the four boilers only in the after stokehold were used. The contractors, Messrs. Delaunay, Belleville, and Co., of St. Denis, France, have guaranteed neither horse power nor speed, the conditions of the contract being that with natural draught and four boilers in use, the coal consumption should be 22·5 lbs. per square foot of grate surface per hour. This would produce 1,250 H.P., and if the other four boilers recorded the same coal consumption, it should give the vessel a speed of 17·5 knots. Although no air pressure was used, the coal consumption recorded was 23 lbs. per square foot per hour, thus exceeding the stipulated conditions by ½ lb. The trial of the four foremost boilers gave the same result. A four hours' trial, for the purpose of ascertaining the quantity of coal consumed when the boilers are working at high pressure, was next undertaken. The two after boilers only of the foremost stokehold were used, and the result recorded was 30·75 lbs. of coal per square foot of grate surface per hour, with natural draught. As this consumption represents an I.H.P. of between 700 and 800, the result was regarded as very satisfactory. At an eight hours' trial for testing the evaporative efficiency of her boilers, the result recorded was that of 8·9 lbs. of water evaporated per lb. of coal. These trials have been watched with great interest, in view of the fact that the "Powerful" and "Terrible" are to be fitted with the Belleville boilers.

At the termination of the Naval Manœuvres the Admiralty gave instructions for fitting a new type of evaporator and distilling apparatus to torpedo-boats Nos. "52," "86," and "87," at Devonport. Nos. "52" and "86" have been completed, and their trials successfully carried out. Each evaporator, the weight of which is only 3 cwt., is guaranteed to distil 32 gallons an hour, or 3½ tons in 24 hours. The makers, Messrs. Caird and Rayner, London, are supplying the same type of evaporator to torpedo-boats at Chatham. They have also received instructions to supply the same kind of evaporator to the torpedo-boat destroyers, and these being of a larger size than those fitted to the torpedo-boats, each one will be capable of producing 93 gallons an hour, or 10 tons in 24 hours.

The 1st class battle-ship "Repulse" has completed her gun trials satisfactorily. The armament of 6-in. and small Q.F. guns was first tested; the former were fired at elevations varying from 3° to 10°, with normal recoils, the lowest being 11½ in., and the highest 12¾ in.

The conditions under which the firing took place from the four 13½-in. 67-ton breechloaders, carried in a couple of barbettes, were practically the same as on the many previous occasions when they have been tested on board Her Majesty's ships. Three rounds were discharged from each gun, the first with three-quarter charges (472½ lbs.) of slow-burning cocoa powder, technically known as "S. B. C.," and the remainder with full charges of 630 lbs., carrying a projectile weighing 1,250 lbs. The two first rounds were fired independently, and the last round from each pair simultaneously, with the object of subjecting the recoil presses and other hydraulic fittings to the severest test that can be applied. When both guns were run out together, though not exactly on the beam, the ship was found to heel over 2° to starboard. A round was also discharged from one of the guns in each barbette with extreme elevation (about 14°), for the purpose of ascertaining the

maximum recoil. The following was the programme of firing as actually carried out:—

Fore Barbette.

Gun.	Rounds.	Charge.	Elevation.	Bearing.	Recoil.
Left gun...	1	Reduced	Horizontal	Starboard beam	2 ft. 4 in.
	2	Full	5°	10° abaft „	3 ft. 9½ in.
	3	„	5°	14° „ „	4 ft. 0½ in.
Right gun..	1	Reduced	Horizontal	Starboard beam	2 ft. 7 in.
	2	Full	Extreme	10° abaft „	4 ft.
	3	„	5°	14° „ „	3 ft. 11½ in.

After Barbette.

Gun.	Rounds.	Charge.	Elevation.	Bearing.	Recoil.
Left gun...	1	Reduced	5°	10° abaft port beam	2 ft. 7 in.
	2	Full	5°	10° before „ „	3 ft. 9½ in.
	3	„	5°	5° abaft „ „	2 ft. 11 in.
Right gun..	1	Reduced	5°	10° „ „ „	2 ft. 6 in.
	2	Full	Extreme	10° before „ „	3 ft. 9½ in.
	3	„	5°	10° abaft „ „	3 ft. 6 in.

Only one misfire occurred.

The principle and design of the hydraulic mountings for the barbette guns of the "Repulse" are practically identical with the gear supplied by the Elswick Company to the sister ships. Experience, however, suggests improvements in apparently the most perfect mechanical appliances. In the hydraulic equipment of the forward barbette of the "Repulse" there are two novelties, which may be regarded as distinct advances. The new arrangements are a development of the duplications made to prevent disablement in the event of a breakdown taking place in one of the services. The existence of only a single hydraulic supply for working and traversing guns upon each turntable has long been a source of danger, and hence great importance was attached to the trial of a device which had been tentatively fitted to the forward barbette, with the object of proving the practicability of working the heavy guns after the main supply of power had given out. In all the older battle-ships any failure in the supply pipes on one side of the barbette necessarily throws both guns out of action. By the new arrangement the supply is provided from both sides, so that, in case of the pipes on one side being fractured, those on the other remain efficient. Nothing could have been better adapted to demonstrate the practical utility of the new fittings than the ordeal to which they were subjected during the firing. The main supply was shut off as though it had actually been disabled, and the whole of the gunnery trials forward were carried out by means of the auxiliary supplies. As the copper hydraulic piping to all the important working parts is apt to fracture under exceptional strain, and as, in consequence of its numerous curves and complicated leads, it cannot be readily renewed, measures have also been taken on board the "Repulse" for providing spare lengths of india-rubber hose encased in strengthening spirals of steel wire, by which the defective pipes may be expeditiously replaced. The flexibility of the substitute enables it to be easily fitted in difficult positions. The hose-piping is about an inch in internal diameter, and, though it was worked experimentally in the forward barbette at a pressure of 1,000 lbs. to the square inch, it answered its purpose

admirably, and it is proposed to adopt it in all ships of the "Royal Sovereign" class. Similar hose, but of much greater diameter, has been fitted to the main supply pipes connecting the duplicate pumping engines, but this remains to be tried. As the breech arrangements of the 13½-in. guns are liable to derangement, it is contemplated to provide the guns with spare mechanism, but so modified in design that the same set will suit either a right or a left hand position. A set has been actually supplied to the "Repulse" for subsequent trial.

A useful Return, made up to the 15th December last, entitled "Navies (England and other Countries)," showing "battle-ships and cruisers built, building, and preparing to build, for England, France, Russia, Germany, Italy, and Austria." was laid before Parliament by the Admiralty at the latter end of February. Although not perfectly accurate, the Return will undoubtedly answer the purpose of conveying, even to people ignorant of naval matters, a fair enough idea of the position our fleet holds at present relatively to those of the other great Powers quoted. As our space is limited, we shall only quote here the figures of comparison between the different classes of ships of our own fleet and those of France and Russia, adding the new ships proposed to be laid down this year, as stated in the First Lord's Memorandum and which are not shown in the Return, while, with regard to the ships under the heading of "Building," we shall point out briefly the state of approaching completion, advancement, or otherwise of the different vessels which are included under this category. It is difficult to understand the principle which has been adopted in the classification of the cruisers, as we find, under the heading of 1st class cruisers, armoured, belted, and protected cruisers all lumped together, including such ships as the "Nelson," "Northampton," "Shannon," "Minotaur," &c., vessels now incapable of maintaining a speed of 12 knots, and quite unfit to undertake the duties of, or to be considered as, cruisers, in the modern sense of the term. As a foot-note says, these vessels may be considered as 3rd class battle-ships, we shall count them under that head. We shall strike off, therefore, from this list all vessels with a less speed than 15 knots, whether our own or foreign; similarly, in regard to 2nd class cruisers, there are certain ships, both English and foreign, which, although of considerable tonnage, yet, from the absence of any protection according to modern ideas and their want of speed, ought certainly only be placed in the 3rd class, or, better still, in a class of their own. With these corrections, the Return may be made to show us pretty nearly how we stand.

1st Class Battle-ships Built (*31st December*, 1893).

	England.	France.	Russia.
	15	9	3
Total ..	15	12	

Building or Preparing to Build.

	England.	France.	Russia.
	7	6	6
Total ..	7	12	

Adding together, therefore, the 1st class battle-ships, built, building, and preparing to build, England is in a minority of two, and the list stands thus—

	England.	France.	Russia.
	22	15	9
Total ..	22	24	

We must point out, however, that of the seven ships under the heading of Building, &c., credited to England, four, viz. the "Royal Oak," "Revenge,"

"Repulse," and "Barfleur" are now practically complete and ready for sea; of the three others, the "Renown" has been commenced about a year, and may possibly be launched this year, while a commencement was made with the "Magnificent" at the end of November, and with the "Majestic" in the second week in March. Of the French ships under the same heading, one, the "Brennus," is about to undergo her trials, and will be completed this summer; two others, the "Charles Martel" and "Jauréguiberry," were launched last year and are to be completed next year; while the remaining three, the "Lazare Carnot," "Bouvet," and "Masséna," are to be launched this year. Of the six Russian ships, the "Navarin" is approaching completion, and ought to be ready for her trials in the spring; the "George the Victorious" is also practically complete; the "Three Saints" was launched last November; and the "Sevastopol," "Petropavloski," and "Poltava" are to be launched as soon as the ice will permit in the Neva according to present arrangements.

Projected, and to be Laid down in 1894.

England.	France.	Russia.
7	3	2

Of these ships none of the English seven have yet been commenced; in fact, only five are really to be taken in hand this year, according to the First Lord's statement. Of the three French, two, the "Charlemagne" and "St. Louis," were commenced during the first week in January; the contract for the third, the "Henri IV," has only now been signed, but she is to be proceeded with forthwith. The Return only shows one Russian ship as projected for this year, viz., the "Paris," which has already been commenced at Nicolaieff, but, according to latest information, a second vessel, to be of the same type as the "Three Saints"—that is, over 12,000 tons—is to be commenced almost immediately also at Nicolaieff.

Summing up the 1st class battle-ships built, building, and to be laid down in 1894, we have—

	England.	France.	Russia.
	29	18	11
Total ..	29	29	

It is clear that our present programme only puts us on a bare equality with France and Russia combined, as far as this class of ship is concerned.

Coming now to—

2nd Class Battle-ships Built (31*st December*, 1893).

	England.	France.	Russia.
	12	9	4
Total ..	12	13	

Building or Preparing to Build.

	England.	France.	Russia.
	0	4	2
Total ..	0	6	

And to these must be added two more of 8,880 tons, which are about to be commenced in Russia.

Summing up under the three headings, therefore, we find—

2nd Class Battle-ships.

	England.	France.	Russia.
	12	13	8
Total ..	12	21	

Which gives France and Russia a preponderance over ourselves of no less than nine in this class of ship. Eight out of the 12 English ships are, moreover, armed with only muzzle-loading guns for their principal armament, although, presumably, the "Dreadnought" on her return from the Mediterranean, and possibly the "Neptune," will be re-engined, and re-armed with breech-loading guns, as has been already done with the "Thunderer" and "Devastation." Three out of the 13 French ships, viz., the "Richelieu," "Colbert," and "Trident," are old and built of wood, with no proper internal bulkhead subdivision; but, on the other hand, with the exception of the "Peter Velikie," all the Russian ships are quite new, and are more formidable vessels than the bulk of our ships in the same category.

3rd Class Battle-ships Built (*31st December*, 1893).

We shall add to this list nine ships, which in the Return are placed under the heading of 1st class cruisers, but which a footnote states may be classed as 3rd class battle-ships, viz., the "Warrior," "Black Prince," "Achilles," "Minotaur," "Agincourt," "Northumberland," "Shannon," "Nelson," and "Northampton"; we shall similarly add four French ships, viz., the "Turenne," "Bayard," "Vauban," and "Dugueselin," which appear among the French 1st class cruisers; although, curiously enough, three ships of an identical class, viz., the "La Galissonnière," "Victorieuse," and "Triomphante," are shown among the battle-ships; none of these ships are classed on the French lists as cruisers—they are designated "Cuirassés de Croisière," to denote that they are intended for service on distant stations; the armoured cruisers, on the other hand, are termed "Croiseurs Cuirassés." We shall add three Russian ships taken from the cruiser list, viz., the "Kniaz Pojarsky," the "General Admiral," and the "Minin"; the first named is a central-battery ship, and, although the two last have always been counted cruisers, yet their speed (only 13 knots) hardly entitles them to be considered such now. The list will therefore stand of the 3rd class battle-ships—

	England.	France.	Russia.
	20	10	3
Total ..	20	13	

In this list we have an undoubted superiority, not only numerically, but in the ships themselves, which include such vessels as the "Bellerophon," "Hercules," "Sultan," "Hero," "Conqueror," &c., while no less than eight out of the ten French ships are built of wood and quite out of date.

Armoured Coast Defence Vessels Built (*31st December*, 1893).

	England.	France.	Russia.
	15	14	13
			3 building.
Total ..	*15*	*30*	

Of these coast-defence vessels not much need be said, except that the bulk of ours are armed with old muzzle-loading guns; eight of the French fourteen are small armoured gunboats, and ten of the Russian are Monitors of a very old type, of no speed, slight armour protection, and doubtful seaworthiness; on the other hand there are three quite new armoured gun-vessels, the "*Groziastchi*," "*Gremiastchi*," and "Otvajiny," which have a speed of 15 knots, and are classed by other authorities as sea-going, while the two new vessels lately launched, the "Admiral Senjavin" and "Admiral Uschakoff," being over 4,000 tons displacement, and having a speed of 16 knots, might almost be counted as sea-going battle-ships.

Coming now to the cruisers, we shall show the armoured and belted cruisers on a separate list, instead of placing them altogether with the merely protected cruisers as has been done in the Return.

Armoured or Belted 1st Class Cruisers Built (31*st December*, 1893).

	England.	France.	Russia.
	9	1	5
Total ..	9	6	

The English vessels include the "Impérieuse," "Warspite," and the seven cruisers of the "Undaunted" class; the one French, the "Dupuy-de-Lôme," in consequence of the late accident to her boilers, will not, according to latest reports, be ready for sea for at least twelve months; of the five Russian ships the "Pamyat Azova," now in the Mediterranean, and the "Admiral Nahimov," in China, are the most formidable from their armour protection and heavy armament; the speed of the first is, however, only 18 knots, and of the second 17·5.

Building or Preparing to Build.

	England.	France.	Russia.
	0	5	3
Total ..	0	8	

Of the five French vessels, the "Latouche-Tréville" is in commission and undergoing her trials, the "Charner" is also about to commence hers, the "Chanzy" was launched in February, the "Bruix" is ready for launching, while the "Pothuau" was commenced a year ago; of the three Russian, the "Rurik" is practically complete, while the "Russia" and "Rurik" (No. 3) were only laid down at the end of last year. Summing up under the two headings of built and building we have:—

	England.	France.	Russia.
	9	6	8
Total ..	9	14	

1*st Class Protected Cruisers Built* (31*st December*, 1893).

England.	France.	Russia.
8	2	0

Building, Preparing to Build, or Projected.

England.	*France.*	*Russia.*
5	2	0

Of the five English under this last head, three, the "Gibraltar," "Theseus," and "St. George," are practically complete, while two, the "Powerful" and "Terrible," have only now been commenced; of the two French, one, the "D'Entrecasteaux," was commenced a year ago, while the second, the "Jeanne-d'Arc," has lately been laid down.

Summing up, we have—

England.	France.	Russia.
13	4	0

2*nd Class Cruisers Built* (31*st December*, 1893).

England.	France.	Russia.
38	11	2

Of the 38 English, there are five which are of very doubtful value, and in war time would hardly be sent to sea, viz., the "Inconstant," "Raleigh," "Active," "Volage," and "Boadicea," while among the French eleven there are four, the "Naïade," "Iphigénie," "Aréthuse," and "Dubourdieu," which may be placed in the same category.

Building or Preparing to Build.

England.	France.	Russia.
9	8	0

Of the nine English, six are all nearly complete or will be completed during the year; three, the "Eclipse," "Minerva," and "Talbot," have only lately been commenced; of the eight French, one, the "Suchet," is undergoing her trials, three more will be completed during this year, two are almost ready for launching, and the remaining two may also possibly be launched this year.

Projected, and to be Laid down in 1894.

England.	France.	Russia.
6	6	0

Summing up the vessels under the three headings, and excluding the five English and four French vessels we mentioned above, we have—

	England.	France.	Russia.
	48	21	2
Total ..	48	23	

A proportion of two to one in favour of England, and nearly all vessels of a quite modern type.

3rd Class Cruisers Built (*31st December*, 1893).

England.	France.	Russia.
51	27	3

Of the cruisers, there are four English, the "Tourmaline," "Ruby," "Emerald," and "Garnet," which ought to be struck off the effective list, but, on the other hand, there are no less than 14 of the French vessels, which, although of greater speed and better armed than the four mentioned above, have no deck protection or watertight compartments, and can hardly be counted as effective warships, as they are of wood.

Building, Preparing to Build, or Projected.

England.	France.	Russia.
0	4	0

Summing up, and not striking any vessels off, we have—

	England.	France.	Russia.
	51	31	3
Total ..	51	34	

Of special torpedo-vessels England has three—"Hecla," "Vulcan," and "Polyphemus"—completed, while France has one, the "Foudre," which may be ready this year. Of torpedo-boats, torpedo-catchers, and gunboats the Return makes no mention.

Summing up, therefore, the different classes of ships as they stand under the three headings of built, building, and projected, we find:—

	England.	France.	Russia.
1st class battle-ships	29	18	11
2nd „ „	12	13	8
3rd „ „	20	10	3
Coast defence	15	14	16
Total battle-ships...	76	55	38
„ „ ...	76	93	
Armoured cruisers.....	9	6	8
Total	9	14	
1st class protected cruisers	13	4	0
2nd „ „ „ or otherwise.....	48	21	2
3rd class protected cruisers, or otherwise.....	51	31	3
Total cruisers, armoured, protected, or otherwise ..	121	62	13
Total	121	75	

France.—Rear-Admiral Fournier has been appointed to the command of the Atlantic Division in succession to Rear-Admiral de Libran; he will hoist his flag on board the 1st class cruiser "Duquesne," which, like her predecessor as flag-ship, the "Aréthuse," is a full-rigged ship. Rear-Admiral Sallandrouze de Lamornaix, lately in command of the training squadron, has been nominated member of the council of the Observatory at Paris, in succession to Rear-Admiral Mathieu, appointed to the second section of the general staff. Capitaine-de-vaisseau Michel has been promoted to Rear-Admiral, and Capitaine-de-frégate Le Roy to Capitaine-de-vaisseau. ("Le Petit Var.")

The "Bayard" (cuirassé de croisière), the new flag-ship in China, has left for her station. On her arrival the present flag-ship, the "Triomphante," will be placed in reserve at Saigon. The 1st division of the Squadron of the North and the Reserve Squadron of the Mediterranean were completed to their full crews on the 1st of April, for the coming six months' summer exercises and manœuvres. The 1st class cruiser "Duquesne" has been commissioned as flag-ship of the Atlantic Division in place of the "Aréthuse," which will be placed in the Reserve; the 1st class cruiser "Tourville" is to be commissioned for trials; the 3rd class cruiser "Beautemps-Beaupré" is commissioned to relieve the "Segond" in the Atlantic Division, the latter returning to Brest to pay off and be placed in Reserve; the 3rd class cruiser "Roland" at Rochefort is to relieve the "Magon," a vessel of the same type also belonging to the Atlantic Division, while from the same port the 3rd class cruiser "Lalande," one of six vessels of the same type, of 18,500 tons, 6,000 I.H.P., and a speed of 19·5 knots, is to be commissioned to reinforce the Active Squadron of the Mediterranean. Another of the same class, the "Coëtlogon," has been undergoing her trials after repairs; the result was not satisfactory, the engines only making 115 revolutions a minute instead of 150, giving a speed of 17·2 instead of 19·5 knots; she has been taken into the dockyard hands again at Brest for some further alteration to her machinery, before her trials are recommenced.
("Le Petit Var.")

The Minister of Marine has ordered that the following torpedo-boats are to be commissioned on the 10th April, and added to the effective strength of the Défenses Mobiles—

At Cherbourg: the 1st class torpedo-boat "Dehorter" for Cherbourg, and the 2nd class torpedo-boat "60" for Dunkirk.

At Brest: the 1st class torpedo-boat "145," for service in the 2nd arrondissement.

At Toulon: the 1st class torpedo-boats "176" for Corsica, "179" for Algeria and the 2nd class boat "54" for Toulon. ("Le Petit Var.")

The Minister of Marine has ordered the return to the builders not only of the torpilleur-de-haute-mer "Sarrazin," in which the boiler explosion lately took place, but also of her sister, the "Tourbillon," and of the 1st class boats, Nos. "155" to "160"; all were fitted with boilers of the same type, and for these, boilers of a less dangerous character are to be substituted. ("Le Moniteur de la Flotte.")

The following are the particulars of the new torpilleur-de-haute-mer "Forban," now building at Havre by MM. Normand, and which is designed to have a speed of 30 knots; length, 144 ft. 3 in.; beam, 15 ft. 3 in.; draught, 10 ft.; displacement, 130 tons; I.H.P., 3,200. The vessel will have twin screws, and will carry two torpedo-ejectors and two 1·46 Q.F. guns. The new torpilleurs-de-haute-mer "Argonaute," "Tourmente," and "Averne" have been commissioned to undergo their trials. The new torpilleur-de-haute-mer "Lansquenet" is also at present undergoing her trials, which up to the present have proved eminently satisfactory; with one boiler she can steam 13 knots, and with two has already steamed 16·5, so that a high rate of speed is expected when she is subjected to full power.

("Le Moniteur de la Flotte.")

The armoured 1st class cruiser "Chanzy," which was launched at Bordeaux, on January 24, is the third vessel of her class to take the water; the first, the "Latouche Tréville," was launched at Havre, October 8, 1892, and is now undergoing her steam trials, while the "Charner" was launched at Rochefort, on 16th March of last year, and is now almost ready for the pennant. A fourth ship, the "Bruix," is still on the stocks at Rochefort. These vessels are 347 ft. 7 in. long, 45 ft. 9 in. beam; a mean draught of 19 ft., and a displacement of 4,745 tons. The machinery consists of two twin-screw engines, developing together 7,400 I.H.P. at natural draught, and 8,500 I.H.P. under forced, the corresponding speeds being 17 and 19 knots. The protection consists of a broad all-round belt of 3·8-in. steel, and of an armoured deck varying from 3·9-in. to 1·5-in. The armament consists of two 7·4-in., mounted in turrets on the poop and forecastle, protected by three 6-in. armour, and six 6-in. Q.F. guns in sponsons on the broadside; also protected by three 6-in. armour; four 6-pr. Q.F.; six 3-pr. Q.F.; and six Hotchkiss 1·4-in. Q.F. guns. There are five torpedo-tubes, one on each bow, one on each beam, and one astern. ("Le Yacht.")

United States.—Commenting on the recent trials of the new commercial destroyer "Columbia," "Scientific American," to the courtesy of whose editor we are indebted for the accompanying plans and photograph, says:—Notwithstanding her success, it cannot be said that the speed of the "Columbia" is commensurate with her great power. We believe she is the highest engined of any ships afloat of her size, but not the fastest. Her displacement is 7,350 tons, with 22,000 I.H.P., or 3 I.H.P. per ton of displacement, and her speed 22·8 knots on a short trial trip, strained and driven to the utmost with the hottest fires possible, burning picked coal in quantities greatly in excess of any other ship, and every bearing flooded with oil. Even under these conditions her rate fell at times to 21·11, and the indications are, that it was impossible for her to have made 25·3 knots, as stated, and that she could not maintain even the speed of 21·1 knots on a voyage of any considerable length, say from New York to Southampton. It is doubtful if, on such a voyage, she could maintain an average of 19 knots. The two new Cunarders, "Campania" and "Lucania," built to serve as cruisers when required, each has a displacement of 12,500 tons, a length of 620 ft., a beam of 65 ft., and engines with

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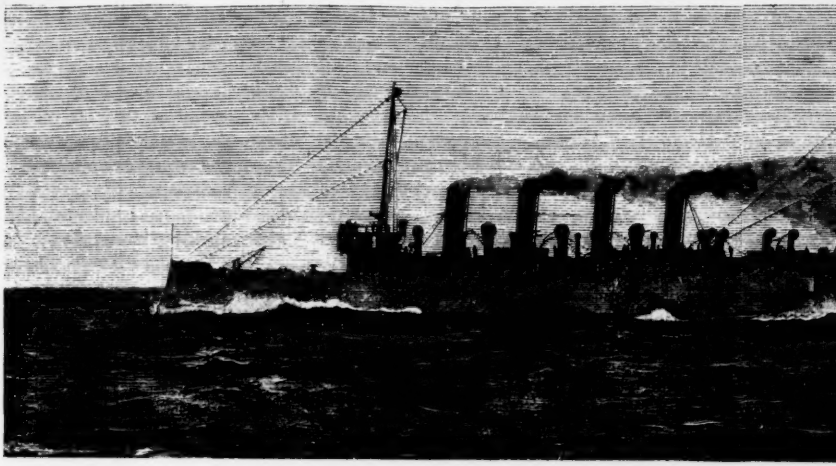
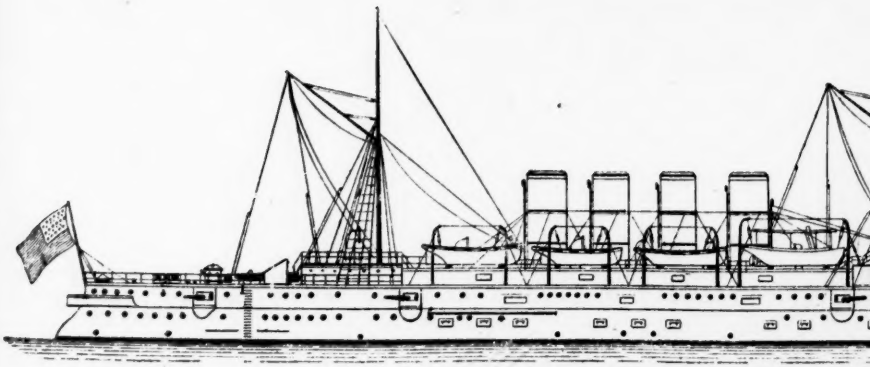


THE "COLUMBIA," 22.8 KNOTS, 7,35

From an Instantaneous Photograph by W. Rau, reproduced by



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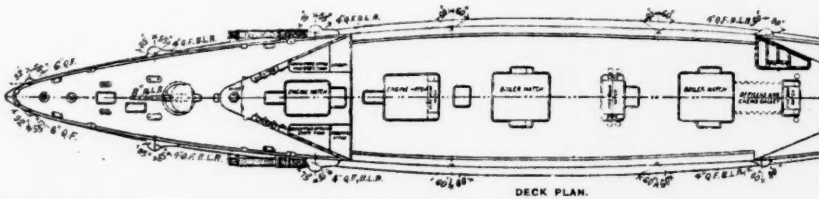
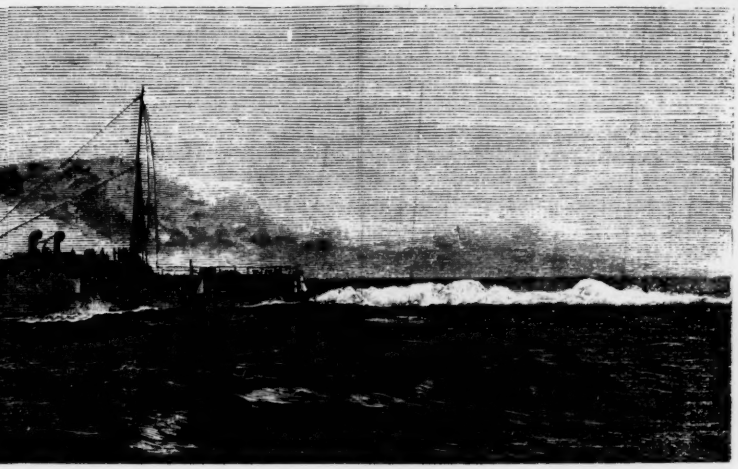


DECK PLAN.

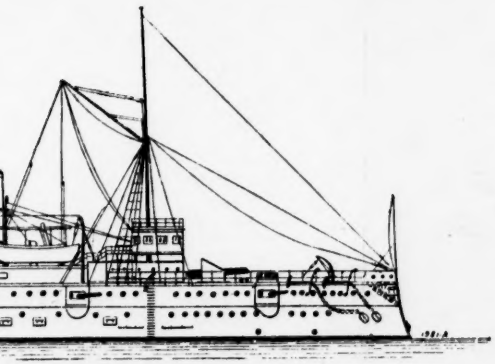
THE NEW UNITED STATES PROTECTED CRUISER "COLUMBIA" (COMMERCE

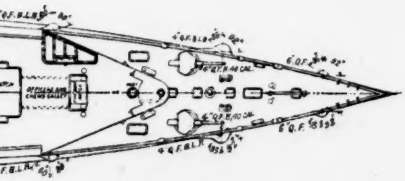
HARRISON & SONS, LITH. ST MARTINS LANE, W.C.

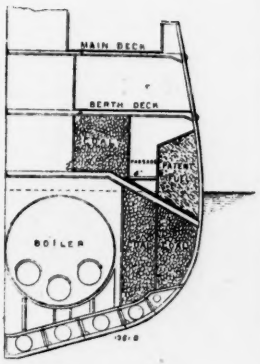


NOTS, 7,356 TONS, 21,000 I.H.P.

reproduced by permission from "Scientific American."







MIDSHIP SECTION.

" (COMMERCE DESTROYER).

55 MARTINS LANE, W.C.

twin screws of 15,000 I.H.P.; the power of the "Columbia" is far greater than these ships, and her displacement far less, yet they have maintained an average speed on runs of about 3,000 miles of 21·3 knots, and on some entire days 22·3 knots. This is their regular employment, and there is little question that, if strained for a spurt, as was the "Columbia," they would beat her; and it is absurd to expect that the "Columbia" could overtake either of them on a lengthened voyage. The steamers "Paris" and "New York" are both built to serve as cruisers; the average speed of the "Paris," on her trial trip, was 21·8 knots, the same as the "Columbia," yet she has a displacement of 13,000 tons; the "Teutonic" is another fast ship of 12,000 tons displacement, and 21·5 knots speed; and others built to serve as cruisers of about equal speed could be mentioned. The Japanese cruiser "Yoshino," of only 4,500 tons displacement and 15,000 I.H.P., attained a speed on four runs on the measured mile of 23·021 knots, of which the fastest run with the tide was 23·76 knots; so that the "Columbia" with engines of a third more power yet ranks well below the "Yoshino" in speed. This is not a result of which our constructors can be proud.

The "New York Tribune," and other papers, have commented in much the same strain on the result of the "Columbia's" trials, and to the effect that the trials as now carried out are artificial, and record a speed which will never again be developed, while the ship and machinery are racked, and subjected to a tremendous strain, and the record is not worth what it costs.

We gave in our December Notes full details of the trial of the "Columbia."

The new 1st class cruiser "Olympia," built at San Francisco, has lately completed her trials. With a length of 340 ft., a beam of 53 ft.; and a draught of 21½ ft., she has a displacement of 5,600 tons. She has a steel-armoured protective deck, which joins the hull beneath the water-line at an angle of 30′; it is 4¾ in. thick on the slopes amidships, 3 in. thick on the forward and after slopes, and 2 in. on the flat central portion. Above the protective deck a belt of cellulose is carried up the sides 2¾ in. thick and rising 4 ft. above the water-line. She has a cast steel ram, and two masts with double military tops. The main battery consists of four 8-in. guns, mounted in barbettes, one forward and one aft, protected by 4-in. steel armour with conical steel roofs and some 10 ft. above the deck, giving the guns a very extended training capacity; ten 5-in. guns, mounted in the central superstructure and protected by 4-in. steel shields, four of which can fire right ahead, four astern, or five can fire abeam on either side. The secondary battery contains fourteen 6-pr. Q-F. guns protected by 2-in. steel shields, six 1-pr. Q.F. guns, and four Gatlings. There are six torpedo-tubes, one in the bow, one in the stern, and two on each side. The ship is driven by twin screws, worked by triple expansion engines of 13,500 I.H.P. with a pressure of 160 lbs. and to make 128 revolutions per minute. The high pressure, intermediate, and low pressure cylinders are of 42 in., 59 in., and 92 in. diameter, respectively, and with a 42-in. stroke. Bronze bed-plates are used throughout. There are six boilers; four double-enders, 15 ft. 3in. diameter and 21 ft. 3 in. long; the other two are single-enders of the same diameter, and 11 ft. long. All can be worked under forced draught on the air-tight fire room system. The total grate surface is 824 sq. ft., and the heating surface is 28,300 ft. She is designed to carry a complement of 466 officers and men. On her first trials a maximum speed of 22·3 knots was attained and an average of 22·15 made, reduced by tidal correction to 21·85 knots. It is understood, however, that some further trials are to be made. ("Scientific American.")

It is understood that the new gunboats "Machiar" and "Castine," have proved so top-heavy that considerable structural alterations are imperatively necessary and will be taken in hand in once.

The new 1st class battle-ship "Indiana" has been undergoing her steam trials, which have proved a great disappointment. She was expected to make a speed of 16¼ knots, but 15·6 knots under forced draught was the highest speed she attained. The ship has a displacement of 10,200 tons and engines of good I.H.P. We gave full details of her and her two sisters in the January Notes.

Aluminium Boats for the Wellman Arctic Expedition.—Thanks to the courtesy of Mr. Wellman we are able to give illustrations of the new aluminium boats on which the fate of his undertaking depends, and the following notes on the strength of the material employed, which has been supplied by the Pittsburg Reduction Company, which firm appears to have distanced all other competitors in the race to make aluminium the metal of the future. Pure aluminium has a tensile strength when cold-rolled of 27 lbs. per sq. in., much too low to enable it to compete with steel or wrought iron. By adding 3 per cent. of copper its tensile strength is increased to from 50·000 to 54·000 lbs. per sq. in., or equal to the best wrought iron, and 65 per cent. of good steel; the weight being one-third only of either. It neither rusts nor tarnishes, and appears not to be affected by prolonged immersion in sea-water, and will eventually probably provide the ideal sheathing for fast vessels. By experiment it was found that a sheet 5 ft. long, 1 foot wide, and 3/32nds of an inch thick, weighing 1¼ lb. per sq. ft., supported at its extremities, would bear the weight of four men—say, 600 lbs.—at the centre, which is twice the stiffness of steel for the same weight. This stiffness does not imply brittleness, for the same plates have been subjected to the blows of a sledge hammer without injury, even without showing dents.

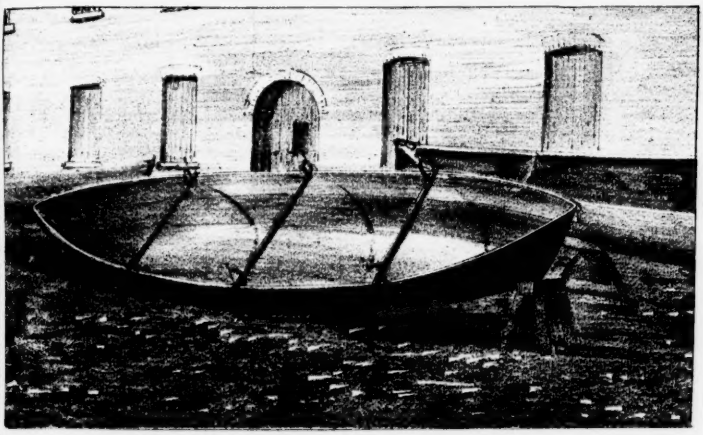
The boats are 18 ft. long, 4 ft. 6 in. beam, and 2 ft. deep amidships; they weigh 450 lbs., against 2,000 lbs. to 3,000 lbs. of the English boats used by the "Pandora," subsequently rechristened "Jeannette," and are intended to accommodate 14 men.

They contain no frames, the gunwales of aluminium angle bars, the thwarts, knee-braces, and the watertight compartments in either end giving the necessary rigidity. Too much rigidity is undesirable, elasticity serving to cushion the blows of the ice and to transmit the force of the concussion through the whole structure. The plating is only 3/32nds of an inch thick. The keel is a plate of aluminium, stood vertically and riveted in. The two watertight compartments, which are to be used also for stowage of instruments, records, and other articles of which special care must be taken, render the craft practically non-sinkable. A bamboo mast will support the sail. The plates which form the skin of the boat are riveted together, clinker style, with strips of Canton flannel between, after the usual manner of building metallic boats. A distinctive feature is the shoe for running upon snow and ice. It is composed of two keels of ash, 10 ft. long, placed 2 ft. apart upon the bottom of the craft. Across the bottom of these keels, and up their outer sides, is riveted a sheet of aluminium 1/8th of an inch, thus forming a perfectly smooth, broad bearing surface, a part of the boat itself, for running upon the snow, the slush, or the hard ice. The space between the bottom plate, the two ash runners, and the skin of the boat is packed with cork, not for the sake of buoyancy, but to take up and distribute the pressure and the blows which will be sure to come upon the bottom plate or sledge. In this construction the runner is as solid as the boat itself. It stiffens the craft enormously fore and aft. It cannot well be broken, and the two pieces of wood, entirely covered by metal, are not liable to become water-soaked or to splinter or crack. Again, ordinary separate runners cut into soft snow, and make the task of pulling exceedingly difficult. With their broad smooth bearing surface these boats are expected to run over snow or slush of any consistency.

MILITARY.

Home.—With reference to the Hebler tubular bullet, it may be of interest to point out that a similar bullet was proposed by the late Sir Joseph Whitworth. The plate and description will be found in his "Miscellaneous Papers on Mechanical Subjects," published by Longmans in 1858.

Aluminium for Q.F. Field Guns.—Now that an alloy of aluminium and copper has been found with the tensile strength of good wrought iron, viz., 50·000 to 54·000



ALUMINIUM BOAT FOR ARCTIC SERVICE.

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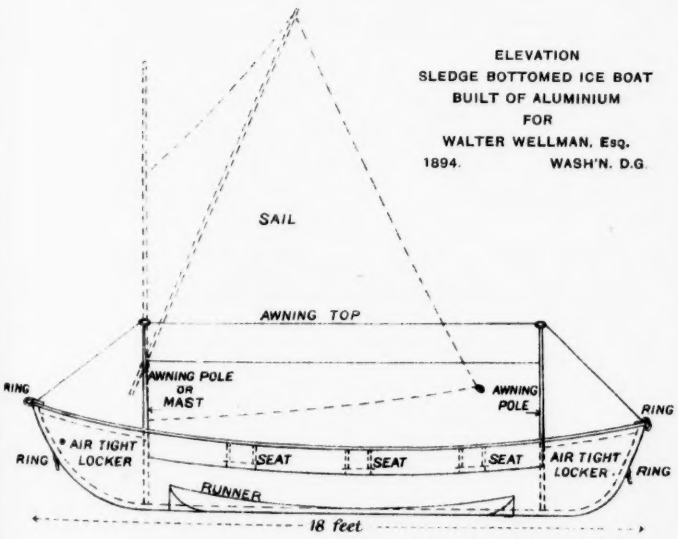

A SKETCH FROM THE DESIGNER'S DRAWINGS.

HARRISON & SONS, LITH. ST MARTINS LANE W.C.

lbs. per sq. in., the difficulties which have so long stood in the way of the construction of a field Q.F. gun of adequate power seem to be removed. The weight of aluminium is to that of wrought iron for equal strength as one to three, and it should therefore be easily possible to construct a hydro-pneumatic jacket of sufficient strength for the weight which could be saved by diminishing the strength of the carriage hitherto requisite to take up the shock of discharge. It is believed that Krupp is experimenting in this direction with nickel-steel, but the saving of weight by the use of aluminium would be almost one-half as great again.

The use of aluminium for limber boxes and for the cartridge cases of fixed ammunition would still further reduce the weights behind the teams. The advantage of the Q.F. principle for field guns lies almost entirely in the reduction of the labour of running up and the consequent freedom of choice of position. On ordinary rolling ground, where the present 12-pr. would have to be fought in the open, the Q.F. could be kept back behind the crest of the slope, muzzles only showing, in the ideal position insisted on in the text-books, but so seldom feasible with full charges in practice.

The "Army Book" gives occasion to the "Austrian Reichswehr" to display the customary continental ignorance of all things British and that appertain to *free* institutions. The taunt that we are "mercenaries" comes ill from the lips of those with whom we have often fought in alliance, and who in the days of their troubles never hesitated to accept our proffered gold—but we can let that pass, content that the writer does admit the great progress accomplished during the past 20 years, and the excellent work done by the authors of the book in question. The Spanish "Rivista Militar" also devotes a page to the same subject, fairer and more moderate in tone, and equally laudatory to the collaborators.

Austria.—The felt munnah is to be abolished and its place taken by a blanket varying according to the size of the horse, from 2·3 to 3·5 m. in length, 1·45 to 1·5 m. broad, and from ·42 to ·47 kilo. in weight, to be placed 6-fold under the saddle. No specification as to material is given, but the weight given appears abnormally light. ("Militär-Wochenblatt.")

France.—According to the "Progrès Militaire" the rearmament of the French field artillery will be completed within three years at a cost of 324 million francs. The new gun will have a calibre of 75 mm., and carries a shell between 5 and 6 kilos., about 1¼ lb. lighter than the projectile of the existing 80-mm. weapon. It appears to be a Q.F., for the rate of fire is given at from four to five rounds a minute, and it is stated that though relaying after every round will be necessary, the recoil will be so slight as to save the detachments the existing heavy labour of running up.

A new infantry knapsack has been approved, of considerably lighter pattern. The Equipment Committee is also following the German lead in the use of aluminium throughout the kit where possible. ("Militär-Wochenblatt.")

The 10th September has been fixed for the commencement of the great manœuvres which General the Marquis de Galliffet will direct. The grand parade, before the President, of the IVth and XIth Corps will take place near Chartres. ("La France Militaire.")

The 1st, 9th, 20th, 25th, and 26th battalions of Chasseurs have been raised by Ministerial decree of the 10th March from four to six companies per battalion. ("La France Militaire.")

In place of the pontoon troops about to be reduced, a proposal to create two new regimental staffs and 28 field batteries was submitted to the Chambers on the 10th March last. Two new Engineer regimental staffs and two companies of sappers drivers will also require to be erected. ("Le Progrès Militaire.")

Germany.—*Long Distance Rides.* Thanks to the kindness of Colonel Winsloe, C.B., lately commanding the Royal Scots Fusiliers, and of his brother, Major A. Winsloe, of the first Hessian Guard Dragoons, we are able to give the following notes on a long distance ride recently executed by the latter with men and horses from his squadron in ordinary marching order and without special previous preparation. The object was to teach the men what could be accomplished, and might reasonably be expected of them, without undue fatigue to man or horse. The detachment consisting of 20 N.C.O.'s and men, Major Winsloe in command, left Darmstadt, at 2 A.M., 1st March, in complete darkness and reached Castel, opposite Mainz, at 6 A.M. Here a halt of 20 minutes was made; the horses were not watered but fed with a little bread, and then the ride was continued, viâ Biebrich, to Rüdesheim, where they arrived at 10 A.M.; total distance, 46 miles. Here, after considerable difficulty and delay in finding stabling, the horses received 4 lbs. of corn, and, when thoroughly cooled down, water with the chill off. Whilst the horses were resting the men clambered up the steep hill at the back of the village to see the Niederwald monument. At 1 P.M. the march was resumed, and Castel reached at 5 P.M., where another short halt was made, and the horses again received a little bread and had their nostrils sponged out, but no water, as the weather was cool and they are accustomed to long periods without water. From Castel they rode straight back to their barracks at Darmstadt, arriving at 9 P.M. without a single sore back or lameness of any kind. Total distance covered, about 92 miles, and average weight carried, 19 st. 6 lbs. The saddle was the German army pattern with blankets very similar to our own in massiveness and weight. The pace a slow jog for 4-kilometre stretches with from 1- to 2-kilometre walks in between. Next morning the colonel of the regiment inspected them at riding drill.

Roumania.—The General Staff has completed a survey of the Moldau district, scale 1/20,000th. Sheets of the map will be published within two years on scales of 1/50,000th and 1/200,000th.

Russia.—The cost of enrolling the last annual contingent is given at 10·3 roubles per head.

A new brigade of frontier guards, to be stationed near Kars, has been sanctioned. It will consist of 18 officers, 1 surgeon, 1 veterinary surgeon, 205 mounted men and 459 foot, 205 horses, 3 train horses, and 18 mules. The detachments at Erivan and Elisabethpol will each be brought up to 10 officers, 152 mounted men, and 358 infantry, with horses and mules in the above proportion. The total strength of these frontier guards will now be 29 brigades, 2 independent detachments, numbering 28,945 men; of these 29, 24 are in European Russia. ("Russki Invalide.")

FOREIGN PERIODICALS.

NAVAL.

United States of America.—Proceedings of the United States Naval Institute, vol. xix, No. 4.—"Notes on Naval Dynamo Machinery" (by Lieutenant J. B. Murdock, U.S.N.). "The Arming of the Brazilian Cruisers 'Nictheroy' and 'America'" (by Howard P. Elwell, A.M.U.S.N.I). "Notes on the Necessity of the Naval War College" (by Commander Stockton, U.S.N.). "The Willson Disc Gun" (by Lieutenant Commander Ingersoll, U.S.N.). "Coal Consumption of Ships of War" (by W. H. Riley, Staff Engineer). "Pigeons for Sea Service" (by Professor H. Marion, U.S. Naval Academy). "Velocity of Combustion of an Explosive under Variable Pressure." Notes, Notices, &c. This admirable journal, unfortunately, reaches us too late for due notice. We can only warmly recommend it to all readers.

Revue Maritime et Coloniale.—Paris. February. "A Method of Arranging the Fire from Low Coast Batteries" (G. Weiss, Captain of Artillery). "Aid to the Wounded and Shipwrecked in Naval War" (Dr. Auffret, Director of the Naval Medical Department at Rochefort). "The Sea Fisheries." March. "Recent Naval Progress" (M. Croneau, Professor at the School of Naval Engineering). "Disappearances at Sea and the Law of 8th June, 1893." Necessity of Fortifying the Great Belt" (Lieutenant Hoegaard, Danish Navy, translated from the Danish). "On the Employment of an Electric Search Light ahead of Fast Ships, with a view of avoiding Collisions." "Vocabulary of Powders and Explosives" (*continued*). "Naval Chronicle" (Foreign). "The Sea Fisheries."

Le Yacht.—Paris. March 3rd, 1894. "The Inquiry into the state of the Navy" (E. Weyl). "Discussions of the Maritime Technical Association" (*continued*). "The Sea-going Qualitities of New Yachts." 10th March. "The Organization of the Torpedo-boat Reserve." "Discussion of the Maritime Technical Association" (*continued*). "The Parliamentary Inquiry into the Navy (E. Weyl). 17th March. "The Navy and the Commission of Inquiry" (E. Weyl). "The Subsidies to the Merchant Marine." 24th March. "The English Naval Estimates" (E. Weyl). "Discussion of the Maritime Technical Association" (*continued*). 31st March. "The English Naval Estimates" (E. Weyl). "Discussion of the Maritime Technical Association."

La Marine de France.—Paris. March 3rd, 1894. "The Stability of Battleships." "The Minister of War and Coast Defence." "Naval Chronicle." 10th March. "The English to the Rescue." "Remarks on the Parliamentary Inquiry" (P. Fontin). "Naval Chronicle." 17th March. "The Navy and the Parliamentary Commission." "France, Russia, and England." "Naval Chronicle." 24th March. "For our Merchant Flag" (P. Fontin). "Questions submitted to the Parliamentary Commission by Admiral Vallon." "Naval Chronicle." 31st March. "A Last Word about the 'Magenta'" (Commandant Z and H. Montéchaut). "Naval Chronicle."

Le Moniteur de la Flotte.—Paris. 3rd March, 1894. "The Defences of Corsica" (M. Landry). "The Navy in Parliament." "The Great English Building Yards (Earle, at Hull). "Naval News, Home and Foreign." 10th March. "Battleships and Cruisers"—(*continued*)—(M. Landry). "The Parliamentary Naval Inquiry." "The Newfoundland Fisheries." "Naval News, Home and Foreign." 17th March. "The Law of the Cadres" (M. Landry). "The Parliamentary Naval Inquiry." "Naval News, Home and Foreign." 24th March. "The Iceland Fisheries" (M. Landry). "Losses and Accidents at Sea during 1893." "Naval News, Home and Foreign." 31st March. "Great Landings" (M. Landry). "The Fisheries and the Ministry of Marine." "Naval News, Home and Foreign."

Marine Rundschau.—Berlin. March, 1894. "Experiments to ascertain the Causes of the Fracture of Boiler-tubes in H.M. Ships, carried out at the Imperial Dockyard at Wilhelmshaven." "The Hygienic Conditions of Santa-Cruz, Teneriffe" (*concluded*). "Report of the Captain of H.M. Ship 'Arcona' on the Revolution at Rio di Janeiro." "Naval News (Foreign)." Appointments, &c.

Mittheilungen aus dem Gebiete des Seewesens.—Vienna and Pola. March, No. 4. "Old and Modern Sailing Merchant Ships." "A Method for determining the Double Altitude Problem." "Electric Search Lights for Coast Defence." "Naval News (Foreign)." New Naval Literature.

MILITARY.

The United Service.—U.S.A. No. 4. April. Hamersley & Co., 1510, Chesnut Street, Philadelphia. "The Reorganization of our Army" (by the Secretary of War, Daniel Scott Lamont). "Origin and Developments of Steam Navigation"—(*continued*)—(by Rear-Admiral Preble, U.S.N.). "A Summer among the Seals" (*continued*). Notices, &c.

Journal of the Military Service Institution.—March. "The Fixed Defences of the U.S." "The Quartermaster's Department. "Organization of the Armies of Europe." "The Provost-Marshal." "Rifle Practice in its Relation to Eye-strain." "A general Review of Existing Artillery. "The Problem of Mounted Infantry Solved by Cyclists." "Balloon Photogrammetry" (by Professor Bache). Attention is called to a long and able review of the "Army Book for the British Empire," by Captain Chester, who shows an intelligent appreciation of the conditions of service in the British Army, and the limitations they impose on attempts to copy from the foreigner, which we wish was more widely diffused in our own country. Such intelligence would save our would-be reformers a great deal of ink and paper, and reduce the wear and tear of military editors' nervous organization.

Austria-Hungary.—Organ der Militär-Wissenschaftlichen Vereine.—No. 3. 1894. Vienna. "The Tactical Training of Artillery" (by Colonel Fricherr von Birago); biographical sketch.

Mittheilungen über Gegenstände des Artillerie- u. Genie-Wesens.—No. 3. 1894. Vienna. "Photo-Electric Projectors"—(*concluded*)—(by Exler, Captain K.K. Engineers). "Improvements in Tachyometrie" (by Maschütz, Captain on the K.K. Engineer Staff). "Cordite Manufacture at Waltham Abbey." "Explosives and Fuzes." Review of German patents under this head.

Journal des Sciences Militaires.—March, 1894. "The Influence of Numbers on the Composition and Working of an Army" (unsigned). "Dernier Effort" (by General Philebert). Worth reading. "The War in Mexico" (by Lieutenant-Colonel Bourdeau). "The Campaign of 1814. The Cavalry"—(*continued*)—(by Commandant Weil). "Cryptographie" (by Captain Valerio).

Revue Militaire de l'Étranger.—March. "The Manœuvres of the VIIIth and XVIth Corps in Germany, 1893." Short *résumé* of movements, and *résumé* of opinions of the German press. The author is evidently not well informed as to the personality of the contributors. The German General Staff does not consider the "Berliner Tagblatt" as an expert on these questions. Gibraltar. Nothing new. Notes. England. "Effectives of Militia and Yeomanry, 1893." Austria. "Statistics of the Austro-Hungarian Army, 1892." "Extension and Enlargement of the 'Kaiser Ferdinand Nordhalm.'" "Russian Budget for 1894." "Switzerland Budget for 1894."

Revue du Cercle Militaire.—4th March. "Practical Schools of Artillery and Engineers in the Portuguese Army." "Recollections of the Tonkin Expedition" (*continued*). "Electric Projectors" (*concluded*). 11th March. "Timbuctoo." "New Drill Regulations of the German Artillery." "The Maritime Route from Europe to Liberia." "Expedition of Lieutenant Dobrotvorsky." "Recollections of Tonkin" (*continued*). 18th March. "Recollections of Tonkin" (*continued*). "New Drill Regulations of the German Artillery" (*concluded*). "The Maritime Route from Europe to Liberia." 25th March. "Recruiting in the Italian Army." "Organization of Military Cyclists."

L'Avenir Militaire.—2nd March. "Too much Unification," *à propos* of St. Cyr and the Polytechnique. "What will be the Tactics of the Future." Comment on La Bataille de Vesles in the 'Journal des Sciences.' 4th March. "*Résumé* of General Brialmont's Speech to the Belgian Chambers on Belgian Neutrality and the Coming War." Worthy of careful study. "Increase in Number of Rounds of Shrapnel Sanctioned for Annual Practice." "Duties of the Commissioners for Civil Employment." 9th March. "Reconstruction of the 'Journal Militaire' and the 'Bulletin Officiel.'" "Universal Suffrage in the Barracks." "The N.C.O.'s of the Artillery." "Decree Fixing the Incidence of the Military Tax." 13th March. "Military Requisitions." "Comments on New Bill submitted to the Chambers." "Who were Responsible in 1870?" Review of Le Blocus de Paris et la Première Armée de la Loire (by A. G.). Favourable. "Recent Promotions in the Cavalry." "The Civilian Minister": a Violent Attack on Freycinet. 20th

March. "Paper Organization." "Criticism on the Proposed Transference of the Pontoon Troops to the Engineers." Figures bearing on this Point. 23rd March. "Plain Clothes for Soldier Servants." 27th March. "Instruction in Fencing in the Ranks." Leader, to show the Impossibility of Adequate Instruction owing to want of Time, &c. Hoenig's "Tactics of the Future." Favourable review. "Military Workmen Regulations, Allowing Soldiers to Assist in Harvesting, &c."

Revue d'Artillerie.—March. "Observation, Security, and the Transmission of Orders in the German Artillery" (by Captain Ferrus). Careful compilation of existing orders. "Note on the Employment of Accumulators with the Chronograph" (by Captain Lelen). "Experiments with Petards" (by Captain Aubrat). "Notes on the Italian Coast Artillery" (by Lieutenant Chayrou). "Expedition of 1830, and Capture of Algiers" (by Captain Rouquerol). Germany. "New Field Artillery, Munitions, and Stores." "Wire-rope Brakes for Field Artillery." Read.

La Spectateur Militaire.—15th March. "Retirement on Pension after 25 Years' Service" (by Noël Desmayons). "The Extinction of Poverty" (by L. Brun). "The 'Stability' of the War Minister, with Reference to the frequent Changes of Last year" (by Guymarais). "Memoirs of General Tercier Boissonnet." "Auxiliary Services." "Re-engagements." "The Pontoneers." 1st April. "Victory on the Offensive or through Shelter." "Remarks on Dowe's Bullet-proof Coat and Nigoté's Bataille de Vesles" (by Brun). "Memoirs of General Tercier" (*continued*). "Officers' Servants in Plain Clothes." "Officers in plain Clothes visiting Posts." "The Militarisation of the École Polytéchnique."

Germany.—Militär-Wochenblatt.—No. 19. "The War on the Loire, 1870" (by Hœnig)—(*continued*). "English Gunboats on Lake Nyassa." No. 20. "The Cause of the Collapse of Napoleon's European System." Interesting; the author appears never to have heard of Trafalgar. "The War on the Loire" (by Hoenig)—(*concluded*) "The Paschwiti Telemeter," with sketches. Appears, at first sight, an infraction of the Waltham patent. No. 21. "Tactical and Strategical Reconnaissance." "Loss of the 'Kearsage.'" "The New Course of Study in the Russian Cadet Schools." No. 22. "Social Democratic Army Reform." "The *simultaneous* Attack." Contrast with the successive attacks in driblets of 1870; practically a plea for Frederic the Great's "line" methods. "The Position Artillery in Neighbouring States." "Electric Projectors." No. 23. "The Simultaneous Attack" (*concluded*). "The Causes of Victory and Defeat in 1870." "Review of the Russian General's 'Woide's' Book." Interesting. "Pirmasens and Kaiserlautern." "Review of Last Number of Krieg's 'Geschichtliche Einzetheiten.'" "British punitive Expedition on the Gambia." No. 24. *Nil.* No. 25. "Pirmasens and Kaiserslautern" (*concluded*). No. 26. "Der Neue Kurs," I. "The War on the Loire, 1870" (by Lettow Vorbeck). "Reduction of Kit in the Infantry" (by Spohr). "Training of Russian Cavalry in Grand Attacks." No. 27. "Der Neue Kurs," II. "Reduction of Kit in the Infantry" (*continued*). No. 28. "The IXth Corps at Vionville and Gravelotte." "English Operations on the Gambia."

Neue Militärische Blätter.—March. "Differences of Opinion and Experiments in the Russian Cavalry." Read. "How can Russia and France communicate Secretly and Safely during a Great European War." Important. "The German Army, Past and Present." "Reflections on Naval Warfare." Correspondence. England. "The New Ship-building Programme." Russia. "Extracts from the Order Book of General Dragomirow." "Exercises of Troops in the past Winter in the Warsaw, Kieff, and Moscow districts." "The Population of Warsaw during the last Year." "An Inspection of Opoltschenie at Moscow."

Jahrbücher für die deutsche Armee und Marine.—April, 1894. "Recollections from my Life." *A propos* of the Festival of the 20th February (by von Henk, Vice-Admiral z. D—). "West Russia and Poland as a Theatre of War." Up to date. "Smokeless Powder in the Austro-Hungarian Manœuvres, 1893" (by Von A. Dietrich). "The Diary of a Prussian Officer, 1813–14–15" (edited by Von Lenski). "How to Supplement the Defensive Value of Existing Fortresses" (by Von Frobenius, Lt.-Col. a. D—). "A Russian View of the German Officers." "The most Important Maps of Russia" (by Von Obermuir). Notices, &c.

NOTICES OF BOOKS.

National Life and Character. CHARLES H. PEARSON. London: Macmillan, 1893. Price 10*s.* net.

Social Evolution. BENJAMIN KIDD. London: Macmillan, 1894. Price 10*s.*

These two books, both in the very first rank of excellence and present importance, we recommend most warmly to our readers, not because either arrives at a tenable conclusion of the subject wherewith they deal, but because both exhibit in the most striking manner the futility of grappling with great social issues without a precise knowledge of all the factors these issues involve.

The conclusions of each are logically faultless, and one feels compelled to accept their premises as far as they go, but each has omitted from consideration the chief point on which both turn.

Mr. Pearson presents us with a picture framed on purely intellectual grounds, which reveals a second "Götterdämmerung," the twilight of the white races and their ultimate submergence beneath the advancing tide of the brown, yellow, and black "brethren," who, avoiding our vices, adopt our perfected weapons, and with them our skill in their *collective* employment. In Europe, socialism spreads, education shatters religion, and "eight hour" days reduce the whole race to the same dead level of unenterprising, swinish imbecility, hastened by the ever present intellect-destroying tyranny of the universal drill sergeant.

Mr. Kidd is more hopeful, and, from the evolutionist's standpoint, shows us that so far from the present tendency inducing stagnation, the law of the survival of the fittest is working with increased efficiency. Modern socialistic legislation—"eight hour" days, compulsory education, and so forth—being merely an unconscious effort of the masses to secure for the individual the fairest possible start in life and the freest possible market for his abilities, using the term in its widest signification to include "character." His reading of the evolutionary problem unfolding itself before us, is, that, contrary to the prevailing opinion of educationalists and pressmen, the civilization of the white races, foremost amongst which he places the Anglo-Saxon, is not the consequence of increasing intellectual capacity, but primarily and almost entirely the result of the survival in the struggle for existence of men with the strongest "character." According to his reading, the white races collectively are, year by year, more swayed in their action not by coldly reasoned-out rationalistic conclusions but by super-rational, *i.e.*, sentimental, considerations, which may or may not be "religious" in the limited meaning of the term; instancing, in support, the growth of national feeling, for which nowadays men will die under torture as willingly, though without hope of future reward, as they formerly died for a doctrine; and with this point of view all soldiers will be in full sympathy with him.

But his ignorance of the true spirit of modern Continental militarism leads him to a conclusion far too optimistic as to the future of the British race. Whilst admitting that compulsory military discipline may result in a general improvement in the national habits of cleanliness and good order, he still condemns Continental military expenditure on the grounds of unproductiveness, and foresees an era of universal repudiation. Now this is precisely what is not going to happen in those States in which the universal liability to military service is enforced, and its consequences organized, in complete harmony with the conditions of the environment. In these countries the army is a reproductive public work from whatever point of view it is regarded. It is the national university in which the

leisured classes, from the highest downwards, are compelled by public opinion to devote their whole time and energy to the development of the "characters" of the youth of the country. A purely literary education tends to the formation of what Bismarck stigmatised as a "literary proletariat," and steadily undermines the producing capacity of a nation. Had Mr. Kidd undergone a three years' course in the ranks of a Prussian regiment we doubt whether his estimate of the future of the Anglo-Saxon race would have appeared to him so secure. For whereas we, as a race, are doing nothing for the evolution of that "character" on which he shows our future depends, our competitors are straining every nerve to turn out their young men to compete with us, in point of "character," in the markets of the world, with what results our business men, who are feeling the pressure of their competition, can tell us. The same discipline, too, would have saved Mr. Pearson all anxiety on the score of the black and yellow races. An army on the battlefield is an exact measure of the degree of evolution of the race it represents, and is more or less efficient in proportion to the sense of duty of all ranks, their intelligence, freedom from bribery and corruption of all kinds. It is conceivable that a future Chengis Khan may marshal his myriads against us, and even authorize his treasurer to buy arms and munitions of war in adequate quantities, but the result would only be sawdust cartridges and gas-pipe rifles, and when the myriads started on their march it would not be our bullets and bayonets that would be called on to stop them, but Nature, with her allies, famine and pestilence, would do the work for us.—F. N. M.

Moltke's Tactical Problems, from 1858 *to* 1882. Edited by the Prussian General Staff. Translated by KARL VON DONAT, late Lieutenant East Prussian Fusilier Regiment, No. 53. London: W. H. Allen & Co., 13, Waterloo Place, S.W. Crown octavo, with 27 plans, &c. Price 28*s.*

A full review of the original work will be found in the pages of this Journal for February, 1893, giving samples of Moltke's method and a criticism of his tactical views. The translation now before us is clear and appears to be accurate. The translator has adhered as closely as possible to the original text, and, thanks to the author, the result is more satisfactory than might have been expected, for fortunately Moltke never picked up the German style of long involved sentences so scathingly satirised by Mark Twain. The book should prove of immense value to all officers, but specially to students for the Staff College and field officers about to qualify for promotion, for they will find in it examples of the tactical disposition of small forces of all arms, up to and including a division, handled with a clearness which needs no praise from our pen. To the translator we can only express our sense of the deep gratitude the Services ought to owe him, for the self-sacrifice and labour he has expended on his task, and we trust his reward may be something more substantial than merely empty expressions of thankfulness, and that before long every officer will have provided himself with a copy. When a foreign officer undertakes a work of this magnitude for our benefit, the least we can do in return is to guarantee that he should not be a sufferer in a financial sense.—F. N. M.

Text Book of Fortification and Military Engineering. Part II. 1893. Published by authority. London: Harrison and Sons. Price 6*s.*

The issue of the second part of the Text Book on Fortification and Military Engineering brings this important branch of our military text books well up to date. Only those who have attempted to produce a work of this nature are in a position to fully appreciate the labour and thought involved in its production.

This is not the place to criticise the details involved, but a few words indicating the general tendency of this branch of the military sciences may perhaps induce a wider circle of readers to take the book up than its *rôle* as text book would otherwise secure for it.

For this class of readers the interest centres in the historical chapters. These reveal a process of evolution of special interest at the present moment.

Fortification essentially, has for its object the prolongation of resistance by the accumulation of passive means of protection around the point threatened, *i.e.*, the

expenditure of money and skill in time of peace to obtain what skill and human lives, in sufficient numbers, could effect in time of war.

With every improvement in the active means of attack the value of the passive means of resistance has necessarily deteriorated. A battery of 6-in. Q.F.'s can obviously cut through an old-fashioned revetment more rapidly than Edward III's celebrated siege train. Therefore if the balance between attack and defence is to be maintained, the money spent by either city or state to protect its strongholds should increase in a corresponding ratio. Now this is precisely what has not happened in any portion of the civilised world. The proportion of a nation's wealth sunk in passive defences nowhere attains anything approaching the relative magnitude of the sums formerly sunk in unproductive fortifications. Compare, for instance, the cost of the fortifications of the Netherlands per head of city population during their historic revolt, and the incidence of the charge for the existing Belgian defences. Again, whilst nations are spending less, the progress of artillery requires them to spend more, not only owing to the direct increase in the destructive power of the weapons in use, but because, as their range increases, the perimeter to be defended increases also as the square of the range.

Therefore, ultimately a point must be reached, perhaps has already been reached, where the possibility of direct defence ceases. Since, therefore, money can no longer do the work of human beings, human beings must be trained and organized in peace time, but this leads to conscription, ultimately universal liability to military service, and the money thus spent on active preparations can be shown by hard facts and statistics to be directly reproductive.

Which, therefore, in the future is likely to be the dominant race? The nation which boldly flings passive obstacles to the winds and forces all her sons through a course of training which develops the physical vigour and strength of character, or the country whose inhabitants shirk the sacrifices an active military training implies and trusts its security to bricks and mortar, or their equivalents, only? Taken in connection with Mr. Benjamin Kidd's work on Social Evolution, referred to above, we have here an interesting problem for reflection.—F. N. M.

Untersuchungen uber die Taktik der Zukunft. By FRITZ HOENIG. Berlin: R. Felix, publisher. Price 12*s.* 6*d.*

A new edition, the fourth, of this admirable book, has just appeared. The work originally came out under the title of "The Two Brigades," and consists of a careful analysis of the part played by the 28th Infantry Brigade in the battle of Königgrätz, and by the 38th Brigade (Wedel), at Mars-la-Tour, and from these two actions deductions as to the future conduct of troops are drawn. The book is certainly one of the most important works which have appeared during the past ten years, but curiously has attracted little or no attention in England, though it has been rendered accessible to English readers by a translation which appeared in the Journal of the Military Service Institution, U.S.A., about two years ago.

The chief interest centres round the attack of the 38th Brigade, the true history of which had never before been made public. Hoenig was adjutant to the battalion of the 57th Regiment which formed the centre of the line, and from this position had an unrivalled opportunity of taking in the whole scene.

What he tells us bears no resemblance at all to the description of the incident in the official history, and since for purposes of tactical deduction it is about the most important event in the whole war, we will endeavour to recapitulate it. After a most exhausting march, the brigade formed up in rendezvous columns south of Mars-la-Tour—here it received the order to attack the N.W. angle of the Tronville copses and, without any artillery preparation, at once moved off, the 16th Regiment going round and through Mars-la-Tour to the north; the 57th and two pioneer companies to the south, both in company columns with skirmishers in first line, half battalions in second; the latter appear to have deployed into line immediately. As they crossed the Verdun Metz Chaussée a perfect storm of fire struck them from the north; they were then fronting about W.N.W. and the mounted officers for the first time saw (the men on foot were still concealed) the whole of the 4th Corps (L'Admirault) deployed on the heights of Bruville. The task set them therefore

was, to march diagonally across the front of a deployed Army Corps within the full effective sweep of its fire.

Needless to say they did not persevere with it. Instinctively every one brought up the right shoulder and endeavoured to form a fresh front to the new danger. The 16th on the left being nearest the enemy opened fire at once and managed to penetrate into the ravine which ran like a ditch along the front of the French position, and here they lost a number of prisoners, but the right wing being still far outside the effective range of their own rifles, raced forward without firing a shot, losing men very rapidly. Ultimately they reached the southern edge of the ravine and a sharp fire fight ensued, the closed bodies showing, as might be expected, a marked superiority in fire control. The ravine soon filled with smoke, and though outnumbered three to one, the return fire was beginning to tell, and all was by no means lost, when out of the valley at their feet, where they had hitherto lain concealed, closed French battalions sprang at them with the bayonet. They were not 20 yards distant when first seen, and the shock was too much for the Germans, who turned and ran, being only saved from entire destruction by the daring charge of the 1st Guard Dragoons.

Hoenig's description of the whole scene, as he saw it the moment before he fell wounded, and afterwards whilst lying on the ground, is one of the most vivid, striking pictures in military history, and is invaluable in giving an idea of the effect on men of such terrible punishment and the absolute need of strong discipline to sustain them. The total losses in the brigade, killed and wounded, were 72 officers, 2,000 men, about 48 per cent., of which probably one-third fell in the advance. And the point he wishes to bring out is, that even in face of this tremendous numerical superiority, certainly 5 to 1, and under the most disadvantageous circumstances of ground and preparation imaginable, troops could be brought up to effective range (say 500 yards), still retaining the power of controlled fire, and if one line could reach this limit, then, under cover of its fire, a second and a third one could come up with less loss, so that the attainment of the requisite ultimate fire superiority is a matter of certainty provided the staff have rightly appreciated the necessities of the situation.

A further point for English readers to notice is that it was the companies that advanced in two-deep line that maintained their cohesion and fire control longest and best, and turning to the casualty returns we find that their losses were fractionally lower also.—F. N. M.

Kriegsgeschichtliche Beispiele. By Colonel VON LETTOW VORBECK. Berlin: Decker. Price 10*s.*

This book will be found very useful to officers wishing to get a good general idea of the battles and encounters of the Franco-German War. It is based on the Prussian official history almost too faithfully, for it reproduces many of the incidents in that work, which are nowadays admitted to have been incorrectly described. Chief amongst these is the attack of Wedel's Brigade, which Hoenig and the regimental histories have long since shown to be entirely unreliable. The account of Bredow's charge is also distorted, and neither agrees with the official or with the testimony of eye-witnesses. Read with due caution, however, the book will supply a want formerly much felt at the Staff College.—F. N. M.

Verslag omtrent de Engelsche manœuvres, gehonden in de omstreken van Swindon van 1—15 *September*, 1893.

This is a careful and painstaking report by Lieutenant M. C. Van der Hoog, of the Netherlands Field Artillery, on the manœuvres which were held near Swindon, in September, 1893.

After a brief description of the manœuvre ground, the author proceeds to enumerate the forces, calling attention by the way to the purely temporary character of their organization in brigades and divisions. The camping arrangements are next dealt with, and a few notes follow on equipment and armament.

Pages 18 to 39 are devoted to a description of the manœuvres day by day, giving

in general terms the ideas for the day, the manner in which they were carried out, and a few critical remarks.

Three or four pages of general criticism on the troops complete the report.

The author considers that the British soldiers, though very young in appearance, show good military qualities. He was particularly impressed by the smart manner in which they saluted, by the way in which they handled their arms, and by the activity which they displayed in moving over the ground.

Much attention, he says, is paid in England to elementary training and to close order movements, and the result of this could be plainly seen in the excellence of the march past.

The fire discipline left very little to be desired. The men of the mounted arms are good riders across country.

In short, the elementary training of the troops is in every respect good, but their skill in manœuvring is called in question on many points. In the first place much too little account is taken of the effect of the enemy's fire. The author instances—

Movements in retreat exposed to enemy's fire.

Infantry columns lying down behind guns in action.

Artillery limbers exposed to fire unnecessarily.

Artillery coming into action under close fire of hostile infantry.

Cavalry attacking unshaken infantry without the advantage of surprise.

As regards the infantry he considers that it generally deployed into line too early.

Artillery did not sufficiently reconnoitre the positions which they were to occupy. They were generally placed on a flank, whence no fire could be directed on to the other flank. They were frequently not supported by other arms.

The cavalry often came into line too late. The attacks of the brigades were wanting in connection, the regiments appearing to act independently.

"Circumstances in England," says the author, "are not favourable to the thorough exercising of the troops in tactics. The three Army Corps which England counts on placing into the field are put together for the first time on mobilization. The staffs of the higher units are not formed till then. Neither staff officers nor commanders of units, nor even the troops themselves, have been accustomed to work together in peace time. How can a force so composed be expected to develop at once that organic unity and cohesion which are necessary for success in war?"

The Commander-in-Chief, however, is invited to console himself with the thought that "in time of war he can reckon on the dauntless courage and stedfast perseverance of officers and men, and on the trust which the lower ranks place in the leadership of their superiors."

In conclusion, the author expresses his thanks for the hospitality which was extended to him during 14 days by the British Government and by British officers.—H. D. L.

Illustrated Official Handbook of the Cape and South Africa. London: Stanford. Price 8*s.* 6*d.*

It would be absolutely impossible in the limited space available to notice, however briefly, the many points on which useful information is to be found in the pages of this carefully written and well-arranged volume.

The geological features, the fauna and flora, the products and industries, of each division of the country are fully described, and the history and progress of the several settlements are clearly told. In a volume treating of such a multiplicity of subjects military events could not be given in detail, and are, necessarily, only summarised.

The chapters on ostrich farming, the diamond mines, and the gold-mining at Witwatersand, will have the charm of novelty for most readers.

The illustrations, which are very numerous, differ greatly in merit, most of the views of scenery being clear and pleasing; but the portraits are in some cases almost caricatures, one of Sir George Grey being quite ridiculous. By that exaggerated perspective, which badly-taken photographs sometimes exhibit, the hazy Governor seems to be contemplating the possibility of getting bodily into his enormously magnified hat.

The book tells nearly all that any ordinary reader wants to know about our extensive and rapidly developing South African dominions, and fully justifies its title. O'C.

The Cruise of H. I. and R. M. Ship "Zrinyi" in the East. 1890–91. Gerold and Son, Vienna. 6 mks.

The Minister of Marine for Austria-Hungary has directed the publication of this work. It contains many interesting details, especially in regard to the Yang-tse-Kiang, which river the corvette ascended some 600 miles, and is embellished with many sketches; amongst others of the different fortifications thrown up by the Chinese along the river.

Anglo-Russian Marine Dictionary, containing a Collection of Technical Sea Terms and Words of Command. By Captain DE LIVRON, Imperial Russian Navy. London and St. Petersburg, 1894. Price 4*s.*

This useful little volume of 162 pages is to be followed by another of a similar character of Russian-English sea phrases; both works will be especially welcome to English naval officers.

The Maine Bugle. Published quarterly by the Maine Association, Rockland, Maine. Crown 8vo. Price 1 dollar a year. Editors' Committees from the Maine Regiments.

The first number of this new publication deserves more than a passing notice. It is intended to give the history of incidents in which the Maine Regiments were engaged, and to perpetuate the memory of the men who fell in the great struggles of the Civil War. The following extract will give an idea of its scope and interest, and also throws light on the kind of endurance that may be expected of brave war-seasoned veterans, by the side of which the exploits of recent European wars look small indeed:—

"The charge of the 1st Maine Heavy Artillery at Petersburg, 18th June, 1864.

"On the morning of the 18th of June 75 men of Company I answered 'Here' at roll call. There were 150 at Spottsylvania. Just one-half was gone. I was the second man on the right of the company in the front rank, and next but one to the regimental colours. Of the original eight who formed the first two files on the right, two were dead and three wounded, leaving but three in the ranks, but others had closed up to the right, and our front, although shorter, was still solid. I think it must have been about three o'clock in the afternoon when we came out from our breastworks and began to advance. We moved a short distance to the front, and then up to the right, down a sunken road that ran parallel to the line, where we halted in the line of battle for some time. There was a piece of open woods in our rear, and the bank of the road was so high in our front as to completely cover us from the enemy. We soon found that the rest of the corps was being massed in our rear, and were told what was to be done. The whole corps was to charge in mass, we to lead; and then came the getting ready. Knapsacks, havresacks, and blankets were thrown off, in fact everything that would lighten our load; messages were delivered to be sent home, in case anything happened, and good byes were said. I can call to mind how I stood there leaning upon my musket, looking on. I had no particular comrade to say good bye to; both were dead, one at Spottsylvania, the other at Cold Harbour. I expect my face was white. I know I saw other white faces there and some of them wore shoulder straps, but there was no flinching; it is always harder to wait than to fight. At last we heard from our colonel, 'Attention, First Maine Heavy Artillery—Forward, Guide Right, March!' As we scrambled up out of the road, what a sight was before us! about 1,000 or 1,500 yds. away, across an open field having a little rise and covered with old corn stubble, were the rebel works, bristling with artillery, still as death, awaiting our onslaught. We had become somewhat broken in climbing up out of the road, and the sight before us, together with a few stray shots from the sharpshooters along our front, did not tend to steady the line, so our old colonel, who was, I believe, the coolest man that it would be possible to find, gave the command to halt, took

his station as on dress-parade, ordered his guides on a line, dressed up the regiment, and then put us through the manual of arms as quietly as though we were still in the defences of Washington, and all the while the bullets from the sharpshooters humming about his ears like bees. Then came the word, 'Forward, Double Quick, Charge,' and with a wild cheer which seemed to me more like the bitter cry wrung out in a death agony, we sprang forward. I saw the works plainly before me. I saw the blinding flash of red flame run along the crest of those works, and heard the deafening crash as the awful work began; then the air seemed filled with all the sounds it was possible for it to contain, the hiss of the deadly minié, the scream of the shell, the crackle, crash, and roar of every conceivable missile, and through it all that red blaze along the crest of that work which we must cross, as we, with bowed heads, breasted that storm. Once I fancied I heard the order to fall back, and glanced from right to left to see if it were so; but no; the boys, bent forward with arms at a trail, were still rushing on. At last I could see the faces of the rebels, and hear above the roar their shouts of 'Come on, Yanks.' Again I looked to right, to left, and found that I was almost alone; we were turning back. Then came the rush to get off the field and under cover; the ground over which we must return was covered thick with those who were down—the wounded, dead, and dying together. How I ever got back I cannot tell; it seemed but a moment, and yet we were twenty minutes in that awful place. When about half way I felt something strike my foot, numbing it, and I stumbled forward on my face. I remember drawing up the foot to see how bad it was hurt, and found that only the heel of the shoe was gone, shot off, and I sprang up and rushed on again, but the whole foot was black the next day from the bruise. At last I reached the sunken road. But what a scene! It is too horrible to attempt to describe. Those who have seen such pictures know all about them; let those who have not thank God for it, and not try to learn about them. I remember well that about the first thing I heard as I came into the road was this greeting, from the rest of the corps, 'Didn't you fellows know any better than to go in there?' History says that General Birney massed the Second Corps, and made a desperate charge that day. So he did, but it was the First Maine Heavy Artillery that made the charge alone. The rest of the corps never crossed the sunken road. I went up the road towards the left to where the colonel was, just as General Birney rode up, and heard him say, 'Colonel Chaplin, where are your men?' and I shall never forget his answer: 'There they are, out on that field where your tried veterans dared not go. Here, you can take my sword; I have no use for it now;' and the old hero sat down in the road and cried like a child. Just as night began to close in the adjutant came along and told us to get together and call the roll. We did. Company I got together; we had gone in with 75 men; six privates had come out. There was no roll call in that company that night; one of our number wrote the names on a piece of paper, and, with tears running down his cheeks, handed it to the adjutant; that was all. Out of the 900 men of the regiment about 700 had fallen. Late that night Lieutenant Sam Oakes came to us. He had been knocked senseless on the field, but at night revived, and crawled off. How we hugged him and cried over him! His coming saved our company from being wiped out, but the bruises he got that day cost him his life within one short year. Our colonel was broken-hearted over his loss, and threw his life away at Deep Bottom soon after. He seemed not to care to live after his regiment was gone.

"Such was the charge of the First Maine Heavy Artillery on the 18th day of June, 1864, before Petersburg. I do not believe there was a man came out of that charge without some mark about his clothes. I had a bullet through my cap, cutting off a lock of hair close to the skin, one took off the heel of my shoe, two went through my canteen, one cut the bayonet scabbard in two, and one went through the left sleeve of my blouse, leaving a small splinter in the arm, where it is yet. I have never attempted to talk about that charge; I cannot, neither can I describe it; it is beyond description; but I can see it yet, and suppose I always shall."

Our Railways. Their Development, Enterprise, &c. By J. PENDLETON. London: Cassell & Co. 2 vols. Crown octavo, with illustrations. Price 24*s*.

The ample notices bestowed on this work in the daily press are sufficient tribute

to its merits from a literary point of view—more technical papers guarantee its substantial accuracy; but there are special reasons for recommending it to the readers of the Journal, which we will proceed to state.

The problems of home defence, even given adequate numbers of all arms, is essentially a railway question.

The fleet once evaded or destroyed, the problem becomes analogous to the defence of a river line some 380 miles in length, practically everywhere accessible, with the added difficulty induced by the magnitude of the means of transport available and the impossibility of predicting at what point the blow will fall, the essential point never to be left out of our calculation being, that, given sufficient frontage, one ship can land her cargo in exactly the same time whether she is alone or forms one of a hundred. The time a vessel takes to discharge her lading in Liverpool is not influenced by the number of vessels discharging theirs in the Thames, and you can approximate all these vessels till stem touches stern without altering the nature of the problem.

In the event of invasion, therefore, we are exposed to difficulties incalculably greater than those confronting any other Power. The only means to meet them is to withdraw the bulk of our forces to such a distance from the threatened frontier that they can concentrate on that line in sufficient time to fight a decisive action.

Forty years ago, when people, even soldiers, spoke of invasion, they pictured to themselves express trains flying in every direction bearing men to the scene of action, unloading them even under fire, and the south-coast lines were spoken of as important strategic factors; though in many cases under fire from the sea.

The Franco-German War opened our eyes. The French tried this game of improvised concentration, and failed, as we all know. The Germans, more methodical, succeeded brilliantly by adapting themselves to the conditions of their "environment." We then fell into the usual error of copying the victors, never stopping to inquire whether the limiting conditions were the same in both cases; and for a time military experts warned us to be content with the German rate of concentration or thereabouts, viz., 24 trains a day for a double line. Fortunately the Railway Volunteer Engineers—all of them expert managers—stepped in at this juncture and proved that this estimate of our powers was simply ludicrous, and indeed would have rendered any adequate concentration between London and the sea impossible.

Still the incubus of the Prussian official lies heavily on us. "The engineers are not soldiers enough, and the soldiers are not engineers enough" to insure the full utilization of our exceptional resources, but the point has always to be threshed out by experts on either side, and the only solution of the difficulty that presents itself is, that the soldiers, who certainly have more time at their disposal, should imbue themselves with the spirit of modern railway organization, so as to understand the difficulties of the others better, and thus be able to meet them half way. For such study, books of the character of the one now before us are excellent, and, when once the student has acquired a taste for this line of reflection, Acworth's "Railways of England," Findlay's "Organization and Management of a Great English Railway," not to mention a mass of American literature on the same subject, may all be profitably studied.

Problems in Applied Tactics. By J. Bürde, late Lieutenant 51st Prussian Infantry, Instructor in Tactics at 12, Earl's Court Square, S.W. London: Edward Stanford. Price 2*s.*

It is unfortunate for the author that his little pamphlet should have seen the day during the same month as the similar studies of Moltke. The lesser light is overshadowed by the greater, but, none the less, the little book can be cordially recommended and will be a useful introduction to beginners in the subject.

Diary of a Cavalry Officer, 1809—1815. London: Macmillan and Co. Price 15*s.*

Campagne du Maréchal Soult dans les Pyrénées occidentales en 1813—1814, *d'après les archives françaises, anglaises et espagnoles.* Par le Commandant Clerc, du 49e d'infanterie. Paris: Baudoin. 1894.

Général du Barail. Mes Souvenirs, 1820—1851. 1st volume. Paris: Plon-Nourrit et Cie. 1894. Price 7*s.* 6*d.*

Geschichte des 1st Thüringischen Infanterie Regiments, Nr. 31. Major-General MAX GOTTSCHALK. Berlin: Mittler. 1894. Price 15*s.*

Die Königlich Preuszische Garde Artillerie. History of the 1st and 2nd Guard Field Artillery Regiments. By BEUTNER. Berlin: Mittler. 1894.

La Défense nationale dans le nord, 1792—1802. By P. FOUCART and J. FINOT. Paris: Lechevalier. 1894.

Notes sur l'enseignement équestre (*Autriche-Hongrie*). Par Le Comte DÉNES SZÉCHÉNYI. Translated from the German by A. LEHR, Lieutenant 4th Dragoons. Saumur: Milon. 1893. Price 2*s.* 6*d.* Very highly spoken of by the "Revue du Cercle Militaire."

NAMES OF MEMBERS who joined the Institution between the 1st January and the 31st March, 1894.

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Widdrington, B. F., Lieut. 3rd Batt. K. R. Rif. Corps.
Geoghegan, S., Lieut. Ind. S.C.
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Stradbroke, Earl of, Lt.-Col. 1st. Norf. Vol. Arty. (E. Div. R.A.).

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Moss, C., Capt. Glouc. Regt.
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Heming, Thos. H., Lieut. and Comr. R.N.
Bosanquet, Henry T. A., Lieut. R.N.

V.B.
V.B.
R.N.
Hus.
Subm.
Comr.
.N.